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**Construction Engineering
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of Engineers®**

Engineer Research and
Development Center

Encroachment/Sustainability Technologies Workshop

December 9-10, 2004

Compiled by William D. Goran and Kimberly Fleming

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Encroachment/Sustainability Technologies Workshop: December 9-10, 2004

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ABSTRACT: On December 9-10, 2004, the Office of the Deputy Under Secretary of Defense (Installations and Environment)(DUSD(IE)), the Office of the Deputy Under Secretary of Defense (Readiness)(DUSD(R)), and the Director of Operational Test and Evaluation (DOT&E) sponsored an Encroachment/Sustainability Technologies Workshop. The workshop was hosted at the Strategic Environmental Research and Development Program (SERDP) office in Arlington, Virginia. There were 32 participants from a variety of organizations, including the Office of the Secretary of Defense (OSD), Air Force, Marine Corps, Army, and select contractor staff. The purpose of the workshop was to assess the compatibility of current science and technology Research and Development (R&D) initiatives related to sustainability and encroachment with current Department of Defense's (DoD's) needs and requirements, identify future needs and requirements, and identify approaches to transition results of current and newly identified investments into the application at the field, command, and/or headquarters level.

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Executive Summary

On December 9-10, 2004, the Office of the Deputy Under Secretary of Defense (Installations and Environment)(DUSD(IE)), the Office of the Deputy Under Secretary of Defense (Readiness)(DUSD(R)), and the Director of Operational Test and Evaluation (DOT&E) sponsored an Encroachment/Sustainability Technologies Workshop. The workshop was hosted at the Strategic Environmental Research and Development Program (SERDP) office in Arlington, Virginia. There were 32 participants from a variety of organizations, including the Office of the Secretary of Defense (OSD), Air Force, Marine Corps, Army, and select contractor staff (Appendix A). The purpose of the workshop was to assess the compatibility of current science and technology Research and Development (R&D) initiatives related to sustainability and encroachment with current Department of Defense's (DoD's) needs and requirements, identify future needs and requirements, and identify approaches to transition results of current and newly identified investments into the application at the field, command, and/or headquarters level.

The first day of the workshop began with introductory remarks and a presentation by Bruce Beard of DUSD(IE) entitled Overview of Research and Development Program Drivers. Following Mr. Beard's presentation, the session was opened for a group discussion on drivers for encroachment/sustainability R&D. Afterwards, William Goran with the U.S. Army Corps of Engineers, Engineer Research and Development Center-Construction Engineering Research Lab (CERL), and Robert Holst (SERDP) gave presentations on Research and Technology Programs, Projects, and Requirement Needs and SERDP and ESTCP (Environmental Security Technology Certification Program; see Appendix B for presentations). The remainder of the day was spent in three breakout groups, each tasked with reviewing existing R&D projects and identifying new R&D needs and requirements for range sustainment. Key documents used to facilitate the discussions on the first day were the 2002 "Sustainable Range" Workshop needs statements list (Appendix C), the Consolidated Needs Sheet (Appendix D), and a draft of the Endangered Species Act Encroachment Action Plan (Appendix E) produced as part of the "Army Encroachment/Sustainability Technology Requirements" Workshop held in 2003.

The second day was an open group discussion focused on issues associated with the transition and application of R&D. The workshop concluded with a summary of the key recommendations from this workshop.

Key recommendations were as follows:

Considerations to Improve the Research and Development Process:

Invest in significant improvements to facilitate the transfer of R&D projects to the field/user community.

Contact stakeholders and ensure their involvement at the appropriate steps in the process, and throughout all stages of the research and development process.

Enhance internal visibility of R&D project results and targeting it at the user community.

Appoint a professional with strong experience in and with strong connections to sustainability related R&D projects to the Working Integrated Process Team (WIPT) workgroup.

Establish a R&D “Advisory Group” for the WIPT that:

- Has familiarity with the nature of existing sustainability related R&D projects.
- Has connections to potential donors of R&D projects.

Promote development of technical expertise at the WIPT workgroup level.

Address R&D efforts in the Section 366 and 320 reports.

Potential Emerging Gaps in Sustainability Related Research and Development:

1. Global Repositioning and Expeditionary Training—tools to support Global Repositioning and Expeditionary Training including creation of new military bases/ranges overseas as well as reuse of formerly used bases and ranges (i.e. former soviet bases).

Information Utilities—R&D needed to develop tools and frameworks for capturing, manipulating and analyzing information, particularly geospatial information (GIS) to aid in decision-making.

Joint and Shared Ranges—Tools to help optimize use of existing training areas.

Encroachment Forecasting Capabilities—Improved tools to forecast encroachment and how it is likely to affect operations.

Contents

Executive Summary	iii
Conversion Factors	vi
Preface.....	vii
1 Introduction	1
Mode of Technology Transfer	2
2 Day 1 - December 9, 2004	3
Background and Opening Remarks	3
Breakout Session.....	7
<i>Breakout Group A</i>	<i>7</i>
<i>Overall Observations and Recommendations</i>	<i>8</i>
<i>Breakout Group B.....</i>	<i>9</i>
<i>Overall observations/recommendations</i>	<i>10</i>
<i>Breakout Group C.....</i>	<i>11</i>
<i>Overall observations/recommendations</i>	<i>13</i>
Summary	13
3 Day 2 - December 10, 2004	15
Gaps in Transition and Implementation of R&D Technologies	15
Appendix A: Encroachment/Sustainability Technologies Workshop Attendees List.....	17
Appendix B: Speaker Presentations	19
Appendix C: Need Statements from the 2002 Sustainable Range Workshop	63
Appendix D: Consolidated Needs Sheet	68
Appendix E: Draft of the Endangered Species Act Encroachment Action Plan.....	71
Report Documentation Page	89

Conversion Factors

Non-SI* units of measurement used in this report can be converted to SI units as follows:

Multiply	By	To Obtain
acres	4,046.873	square meters
cubic feet	0.02831685	cubic meters
cubic inches	0.00001638706	cubic meters
degrees (angle)	0.01745329	radians
degrees Fahrenheit	$(5/9) \times (^\circ\text{F} - 32)$	degrees Celsius
degrees Fahrenheit	$(5/9) \times (^\circ\text{F} - 32) + 273.15$	kelvins
feet	0.3048	meters
gallons (U.S. liquid)	0.003785412	cubic meters
horsepower (550 ft-lb force per second)	745.6999	watts
inches	0.0254	meters
kips per square foot	47.88026	kilopascals
kips per square inch	6.894757	megapascals
miles (U.S. statute)	1.609347	kilometers
pounds (force)	4.448222	newtons
pounds (force) per square inch	0.006894757	megapascals
pounds (mass)	0.4535924	kilograms
square feet	0.09290304	square meters
square miles	2,589,998	square meters
tons (force)	8,896.443	newtons
tons (2,000 pounds, mass)	907.1847	kilograms
yards	0.9144	meters

* *Système International d'Unités* ("International System of Measurement"), commonly known as the "metric system."

Preface

This Encroachment/Sustainability Technologies Workshop was sponsored by the Office of the Deputy Under Secretary of Defense (Installations and Environment)(DUSD(IE)), the Office of the Deputy Under Secretary of Defense (Readiness)(DUSD(R)), and the Director of Operational Test and Evaluation (DOT&E). The workshop was hosted at the Strategic Environmental Research and Development Program (SERDP) office in Arlington, Virginia.

This report was prepared by the Construction Engineering Research Laboratory (CERL). The Acting Director of CERL is Dr. Ilker Adiguzel.

CERL is an element of the U.S. Army Engineer Research and Development Center (ERDC), U.S. Army Corps of Engineers. The Commander and Executive Director of ERDC is COL James R. Rowan, and the Director of ERDC is Dr. James R. Houston.

1 Introduction

This special report provides a summary of the presentations, discussions, and working group results from the Encroachment/Sustainability Technologies Workshop, held December 9-10, 2004 at the conference room of the Strategic Environmental Research and Development Program (SERDP) in Arlington, Virginia. The workshop was sponsored by the Office of the Deputy Under Secretary of Defense (Installations and Environment) (DUSD(IE)), the Office of the Deputy Under Secretary of Defense (Readiness) (DUSD(R)), and the Director of Operational Test and Evaluation (DOT&E).

One of the key inputs to this workshop was the report from a previous workshop, also hosted by SERDP. That workshop was held in June 2002. Many of the outcomes from the June 2002 workshop were validated and/or updated at the December 2004 workshop. However, a common observation of workshop attendees was that they hadn't seen the outcomes from the June 2002 workshop and didn't know how this report was being used to help shape future requirements or research programs. Thus, one suggestion from 2004 workshop attendees was that 2004 workshop results be more widely distributed and that we work to create clear paths between the workshop results and subsequent science and technology efforts.

The workshop planning committee included representatives from the ERDC (William Goran) and SERDP (Robert Holst). Both SERDP and ERDC make science and technology investments based upon expressed user needs, and these types of workshops help ERDC and SERDP understand and interpret specific elements of service science and technology requirements. SERDP graciously provided the location for this workshop, and ERDC agreed to publish the workshop results as this special report.

In addition, this report will also be posted on (or linked to) appropriate websites, such as the following:

- Defense Environmental Network Information eXchange – DENIX:
<https://www.denix.osd.mil/>
- SERDP: <http://www.serdp.org>
- The Legacy Resource Management Program:
<http://www.dodlegacy.org/legacy/index.htm>
- ERDC: <http://ff.cec.erdc.army.mil/ponds/home.htm>

- Proactive Options with Neighbors for Defense Sustainability (PONDS)
<http://ff.cecerv.army.mil/ponds/home.htm>

Mode of Technology Transfer

This report will be made accessible through the World Wide Web (WWW) at URL:
<http://www.cecerv.army.mil>

2 Day 1 - December 9, 2004

Background and Opening Remarks

The workshop opened with introductory remarks by Bruce Beard of DUSD(IE). He reviewed the purpose of the workshop and had each participant introduce themselves and provide a summary of the organization or agency they were representing. Appendix A (page 17) contains a list of attendees. Subsequently, Mr. Beard providing a briefing on the various legal, regulatory, committee and organizational “drivers” for the sustainability related R&D program and projects. Appendix B (page 19) includes the presentation slides.

Following this, the meeting was opened for a group discussion. Significant observations and recommendations included:

- Technology development needs to be aligned with policy, procedures and training capabilities. Weapons systems technology is outstripping the capacity of existing training areas.
- Acquisition is a driver for R&D; coordination with Program Executive Officers (PEOs) and Project Managers (PMs) is needed to identify sustainability related R&D projects (i.e, quieter aircraft technology).
- R&D community needs to be present at meetings with the operating and acquisition community to understand relevant needs and offer solutions or opportunities.
- Results from R&D requirements and needs identification workshops must be transmitted back to the attendees and to the Services immediately. Develop and execute specific actions that provide stronger linkages for range R&D and the Defense communities.
- Establish an intermediate group (possibly OSD-level) to balance operators and researchers.
- Even though operator-level requirements generally represent short- to mid-term needs, long-term strategic needs should to be integrated into the R&D process to address changes in force structure and global repositioning efforts.
- R&D is needed to develop tools and framework for capturing, manipulating and analyzing information, particularly geospatial information (GIS) to aid in decisionmaking.

After the open discussion, Mr. Bill Goran briefed the group on sustainability-related R&D programs (Appendix B, page 19, includes presentation slides). In particular he provided an overview of the various programs within the Department that have funded or supported sustainability related projects. Additionally, he highlighted the future and emerging trends and needs confronting the DoD efforts to sustain military training and testing ranges, such as the need for better oversight and a clearer picture of the total inventory of R&D efforts and the need to increase our understanding of the cumulative impact of encroachment areas on testing and training. The following tables were both highlighted in Mr. Goran's presentation. Table 2-1 contains a list of consolidated R&D technology needs in support of DoD sustainable ranges, training, and testing operations and readiness and Table 2-2 contains emerging and future issues requiring R&D support.

Table 2-1. Consolidated R&D technology needs in support of DOD Sustainable Ranges, Training, and Testing Operations and Readiness.

Category	Need
Planning	Regional sustainability planning (stakeholder engagement, resources negotiations, regional problem solving, regional "measures" of success), Linkages across installation plans, Linkages between plans and mission, Linkages between installation plans and community impact, and Linkages between community plans and installation impacts
Infrastructure	Life Cycle Planning & Design for Ranges and Support Facilities, Resource Valuation Methodologies, Instrumentation Technologies, and Platform Interface Technologies
Operation	Integrated Planning/Management Technologies, Best Practices/ Technologies to Optimize Range Operation, Biodegradable/Inert/Green Ammunition, Health and Safety Risk Assessments (explosives, etc.), and Impact Assessments (operability, constraints, etc.)
Maintenance	Restoration and Maintenance of Range Infrastructure, UXO and Residue Identification (no cleanup/remediation), UXO and Residue Management (resource recovery, recycling, reuse, disposal), and Range Clearance and Closure
Encroachment	Off-Range Impact Assessment Processes and Methodologies, Off-Range Impact Mitigation Technologies (dust, noise, smoke, etc.), Total Encroachment Impact Assessment, Metric Development and Quantification (Required Congressional Reporting Item for 2006), Frequency Encroachment Assessment and Mitigation Technologies, Room to Maneuver Optimization Capability Assessments/Technologies (air, ground, sea, undersea, space and frequency spectrum range requirements, re-basing and transformation requirements), Integrated DoD Encroachment Data Warehouse (GIS, inventory, impacts, etc.), and Urban Growth and Development Interface Tools (land use prediction, best use assessment, etc.)
Outreach	Community Outreach/Communication Tools, Outreach/Communication Effectiveness Assessment Processes (Market Research, Branding research, focus groups, etc.), and Regional Development Interface Tools

Category	Need
Acquisition/ Technology	Need for coordination with weapons systems, PEOs, PMs, and DoD acquisition community to ensure seamless integration on weapons systems capabilities and requirements with range sustainability standards and requirements
Technology Transfer	Ensure efficient validation and transfer of R&D products (technologies) to installations for integration into operations, and Ensure efficient and standardized means to communicate R&D products to operational users at installations
Environmental Quality	UXO, Ordnance, Constituent Impact Assessments (potential release on and off-range; No Remediation/Cleanup), Development of Training Simulator Munitions for Use on Ranges to Replace Deplete Uranium/Sub-munitions Use, and Threatened/Endangered Species Assessments/ Technologies (includes marine mammals/underwater noise, etc.)

Table 2-2. Emerging and future issues requiring R&D support.

Type of Issue	Issues Requiring R&D Support
Emerging	Improved Encroachment Forecasting Capabilities
Emerging	Overseas Training Range Development and Sustainment – Global Repositioning and Expeditionary Training
Emerging	Sustainment of Joint and Shared Use Ranges
Future	Jointness
Future	Digital linkages
Future	Integrated with other training capabilities
Future	Reconfigurable/deployable...multi-purpose
Future	Live, Virtual, and Constructive
Future	Protecting what we have...the environment
Future	Spectrum management
Future	Airspace management
Future	Increased live-fire to wider audience

Dr. Robert Holst followed Mr. Goran and presented on the process, project areas, organizational structure, program origins, and funding for the Strategic Environmental Research and Development Program (SERDP) and Environmental Security Technology Certification Program (ESTCP) (Appendix B, page 19, includes the presentation slides). Dr. Holst discussed how a process needs to be established in order to identify, define, and address R&D needs and desired outcomes for range sustainment and encroachment more effectively. He also stressed that partnering with stakeholders and finding ways to leverage opportunities will be significant in ad-

addressing future issues. Information on SERDP's statements of needs, technical areas, and overall goals are in the following Table 2-3.

Table 2-3. FY06 SERDP Statement of Need, technical areas and overall goals.

Category	FY06 SERDP Statement of Need (SON)	Technical Areas	Overall Goals
Cleanup	Improved Understanding of the Distribution and Impacts of Subsurface Remedial Amendments in Groundwater, Development and Placement of Amendments for In Situ Remediation of Contaminated Sediments, Assessment and Measurement of Processes Impacting the Fate and Transport of Contaminants in Sediments, and Containment/Treatment of Energetic and Propellant Material Releases on Testing and Training Ranges	Site Characterization, Remediation, and Monitoring	Protect communities & reduce cleanup costs
Compliance	Range Environmental Fate for Energetic Materials, Range Environmental Transport Exposure Assessment for Energetic Materials, and Development of Miniaturized Sensors to Monitor or Determine Environmental Parameters (SEED)	Emission Monitoring/Control, Noise Compliance, Waste Disposal, and Range Management	Reduce impact on operations
Conservation	Examination of Endangered and Threatened Species Habitat Fragmentation Issues On and In the Vicinity of DoD Installations, Restoration of Longleaf Pine for Red-Cockaded Woodpecker Habitat, Methodology for Scientifically-Defensible Population Recovery Goals for Listed Species, and Innovative Conservation Initiatives in the Areas of Integrated Natural Resource Management, Invasive Species Control, and Cultural Resources Management (SEED)	N/A	N/A
Pollution Prevention	Reduction/Elimination of Non-Hazardous, Solid Packing Waste, Environmentally Benign Runway Deicing, Environmentally Benign Synthesis of Energetic Compounds and Their Precursors, and Environmentally Benign Finishing/Coating Systems for DoD Substrates	Alternative Maintenance, Alternative Manufacturing, Material Substitution, and Recycling/Reuse	Reduce mission impacts & improve readiness
Unexploded Ordnance	Development of Innovative Signal Processing: Exploitation of Geophysical Data Collected at the UXO Standardized Test Sites, Sensor Phenomenology of Unexploded Ordnance in Underwater Environments, Innovative Technology for Wide Area Assessment of Sites Potentially Contaminated with Unexploded Ordnance, Development of Handheld and Man-Portable Platforms Supporting Geophysical Surveys of Unexploded Ordnance Contaminated Sites, and Innovative Technology for Detection, Discrimination, and Remediation of Unexploded Ordnance	Site Characterization, Remediation, and Cued Identification	Risk & costs reduction

Breakout Session

Following the briefings, a breakout session was held. The larger group was divided into three smaller groups. All three breakout groups were given the same objectives, namely to:

- Identify overlooked needs based on a review of previously generated needs statements.
- Identify emerging/looming needs or research areas.
- Identify additional R&D requirements at a high level.

Breakout Group A

Discussions within this breakout group began with a recognition that participants from the operational community were not present. As such, the group acknowledged limitations in being able to fully address all breakout session objectives. As an initial activity, the group reviewed a table summarizing R&D needs statements from the 2002 Sustainable Range Workshop (Appendix C, page 63). After significant discussion, the group concluded that the summary of R&D needs was still valid and representative of current R&D needs. After completing the review of R&D needs, the group turned its attention to general needs in two areas — integrated installation and range planning and noise. The group developed a general problem statement and needs statement for each area as summarized in Table 2-4.

Table 2-4. Problem and needs statements from Breakout Group A.

Focus Area	Problem Statement	Needs Statement
Integrated installation and range planning	Installations and ranges need to support current and future missions. However, installation and range planning efforts are disparate and varied and not well integrated.	Management and policy tools are needed to aid in integrated planning to optimally support training and mission requirements while addressing community concerns and community development.
Noise	Requirements and needs are currently not well articulated for noise. Operators may have needs for improved noise monitoring or noise outreach techniques, but these are not clear.	Policy and management tools may be needed in the area of outreach, annoyance models, airborne versus underwater modeling, and noise management. There is also a need to integrate existing tools for improved day-to-day noise management.

At the end of the discussion on noise, the group concluded that noise R&D needs were largely covered in the R&D needs summary handout.

During the last part of the session, the group focused on programmatic issues and the need for an established process to identify range sustainment R&D requirements from the operator level. The group also addressed the need to integrate operational requirements and higher-level objectives into the R&D process to ensure that R&D efforts address new tactics and changing missions as well as near- and mid-term needs.

Overall Observations and Recommendations

- An institutionalized R&D requirements process does not exist for the range sustainment community.
- In order to effectively generate R&D requirements tied to user/operator needs, execute the following:
 - Institute a process that defines range sustainment goals for installations/mission type, weapon system, etc. Range managers and operators need to be informed on long-term sustainment requirements in order to identify problems, needs, and gaps that need to be filled by R&D.
 - Integrate operational requirements into the range sustainment process to provide the necessary guidance and drivers over the next 5, 10, 15, 25 years to accurately assess impacts, constraints, and related technology development needs. Consolidate and validate R&D needs to create R&D requirements, and then prioritize.
 - Establish an evaluation and feedback process to ensure that priority requirements are addressed in a timely manner and that validated requirements remain current through scheduled reviews institutionalized by DoD and the Services.

Breakout Group B

The group's first task was to review the Consolidated Needs Sheet (Appendix D, page 68) and decide if the categories and types of needs within those categories remain valid. Afterwards recommendations for each category were made. The results of this discussion are in Table 2-5.

Table 2-5. Category validations and recommendations from Breakout Group B.

Category	Valid Statements	Comments/Recommendations
1. Planning	Yes	The last two statements need to be sub-sets of the 1st statement, the word "strengthening" needs to be added to the 3rd statement, and a new statement addressing Range Operational Future Needs should be added.
2. Infrastructure	Yes and No	The 2nd two statements were too vague.
3. Operational	Yes	The word "operation" needs to be defined and a new statement addressing Improved Fusing, Transponder Locators, and Self-destruct Mechanisms should be added.
4. Maintenance	Yes	A new statement addressing Perchlorate should be added.
5. Encroachment	Yes	The word "off" needs to be taken out of the 1st two statements which would in turn make those statements applicable from both sides (military and outside community), a new statement addressing Whitespace/Undocumented Personnel on Ranges should be added, a new statement addressing Predictive modeling/simulation should be added, and the 6th statement should be a separate #10.
6. Environmental Quality	Yes	None
7. Outreach	Yes	None
8. Acquisition/ Technology R&D Interface	Yes	While this is a valid statement, it is a process issue, which is not the same as the other needs.
9. Technology Transfer	Yes	While this is a valid statement, it is a process issue, which is not the same as the other needs.

At the conclusion of the breakout session, the group decided to add two new categories: Data Management (#10) and Allocation (#11) to the list. The group decided that Data Management (#10) should be further divided into the following sub-bullets: data warehouse, graphics (GIS), portal, and research sharing (metadata). The group also decided that the category Allocation (#11) should address "What is/is not being funded?" and "What is the impact if an item that is not being funded?"

After reviewing the Consolidated Needs Sheet (Appendix D, page 68), the group was subdivided, based upon the participants' expertise, into three smaller units to review the needs stated in the 2002 Sustainable Range Workshop handout (Appendix C, page 63). The results of the discussion are presented in Table 2-6.

Table 2-6. Validation and recommendations for needs stated in the 2002 workshop handout.

Category	Valid Statements	Comments/Recommendations
Noise, Air Emissions, Safety, Water Quality, and Other	Yes	Some of the needs statements need more of an update (Ex: Dust PM 2.5: Fine dust is not addressed) and the Others category needs to be revisited and topics need to be put in the correct categories.
Munitions and UXO	Yes	Some of the munitions needs statements need to be updated and the needs statements for Unexploded Ordnance (UXO) are mostly up to date.
Threatened and Endangered Species (T&ES), Land Use, and Invasive Species	Yes	For the Land Use category, the definition needs to be revisited to ensure it is correct. A new statement addressing Buffers/Easement areas outside of bases should be added. The 8th statement under land use should include whitespace and easements. The 9th statement under land use should have "and installations" added to the end. The 1st statement under invasive species should address the transport of species.

Overall observations/recommendations

- The preponderance of the needs statements from the Consolidated Needs Sheet handout (Appendix D, page 68) still remains valid with some minor adjustments. However, two new categories (Data Management and Allocation) need to be added to address current issues in the R&D realm.
- A second workshop should be considered to validate, update, and identify new needs statements based on the work accomplished in the 2002 Workshop. At this new workshop, the participants can review the current list to include actions taken on the 2002 Sustainable Range Workshop handout (Appendix C, page 63) and add new ones as appropriate. The new list can then be prioritized for use in building future R&D needs statements.
- The user communities' (trainers and testers) need to continue to be involved throughout the R&D lifecycle to better ensure the likely transfer of technology.

Breakout Group C

Group C reviewed the key emerging drivers (guidance referred to in Bruce Beard's presentation; presentations begin on page 19), such as the 320 and 366 reports, and the 2811 and 2812 authorities provided in the 2003 Defense bill. They agreed that technology can assist in the development of better approaches to make informed and consistent decisions about prioritizing actions and communicating Defense organization's rationales for actions.

The group noted that the 320 and 366 reports provide challenges to the Defense Department to better quantify the condition of ranges and the extent of encroachment. These reports should help drive certain technology outcomes, especially as they relate to the integration of encroachment concerns, quantification of data across different types of concerns, and integration of data into analysis and presentation environments to facilitate communication and decision-making.

The group spent the majority of their time reviewing the Need Statements Sorted by Category that emerged from the 2002 Sustainable Range Workshop handout (Appendix C, page 63) sponsored by SERDP. Rather than focusing on validating or invalidating every line-item in the Category, the group decided to highlight specific areas, such as Threatened and Endangered Species (T&ES) and Land Use issues, where R&D investments might bring value to the Department. The group also addressed some of the emerging challenges from capturing these R&D investments. The results of this discussion are shown in Table 2-7.

Table 2-7. Needs by category.

Category	Needs Statement	Comments/Recommendations
T&ES	Need way to extrapolate data from one species to another (with caution).	Revise needs statement to "need protocol for assessment of the mission impacts on species that builds upon institutional knowledge, therefore reducing the cost and timeframe for each new species and mission context." Creating a "dynamic knowledge engine" that can allow existing information to be applied to similar or related species and mission scenarios. Develop a "smart interface" to aid in identifying new information for a similarly related scenario. This could use one or more projects that would build the knowledge environment and create the usage protocol for this environment to answer the need statement (e.g. protocol for assessment).

Category	Needs Statement	Comments/Recommendations
T&ES	Need to export biodiversity (i.e. processes for recovery of endangered species off of military lands such as corridors).	Concurred with this need. Another effort could be focused on the impact of installations on a regional scale, and the proportionate roles of installations in recovery efforts. This topic may or not surface in response to the current (FY06) statement of need, so it should only be considered if no suitable response addresses this issue.
T&ES	Need a better understanding of military impacts to essential fish habitat.	No specific recommendation.
T&ES	Need to determine what constitutes Level B harassment in the Marine Mammal Act	Concurred with the statements on marine mammal harassment events, but note that SERDP and the Navy were working hard to address this R&D issue (and in a broader context that just what constitutes Level B harassment).
Land Use	Need for programmatic coverage of training activities, need regional planning tool, and need for future planning tools to optimize land uses inside and outside installations	It was unclear what "business process" this needs statement supports (one of the requirements refers to Section 7 consultations; to some extent, the 2811 and 2812 opportunity assessments will need these types of tools). There are some projects that would serve as building blocks or resources to address these needs (e.g. projection of future land uses in the regions of installations, work by ERDC-CERL and DOE Oak Ridge National Lab), but there is still a gap between the vision in these statements for a regional planning tool and the actual capabilities that will emerge from these R&D investments. A regional planning protocol should probably help drive any future R&D investment.
Land Use	Need for better road design (hydrologic displacement/disruption) that takes into account slopes and soil erosion/sedimentation.	There has been extensive work by the Army and SERDP on erosion processes, and recent findings (SERDP SEMP R&D at Benning) on the extent that road length and stream crossings of roads contribute to sediment in bottomlands and streams. The group thought that the SERDP TTAWGs (Compliance/Conservation) might want to further consider this road topic, focusing on improved designs for stream crossing or road reduction efforts.

Category	Needs Statement	Comments/Recommendations
Land Use	Need a means to manage the information necessary to support comprehensive range sustainability plans. Tie in a variety of elements including: TRI, groundwater effects, ordnance location, population densities, mitigation measures, quantification of encroachment impacts on training and testing. Assemble a data management system that can be used by operators for their specific mission requirements.	This need relates to both the 320 and 366 requirements, but looks first to the local installation and range planners. The need, in part, can be addressed with effective use of GIS technology, with a good set of protocols to help guide this use. In addition, there are some complex interactions between these data elements that would require research, and some requirements relating to how such comprehensive range data can be accessed, shared, protected and presented to inform planning, real-time use and decision-making. There are several potential R&D topics implied in this need.

Overall observations/recommendations

Group C stressed the importance of transmitting to meeting attendees and the Services the recommended R&D requirements and needs generated at workshops immediately. Develop and execute specific actions that provide stronger linkages between the R&D community and the Defense range sustainment community.

Summary

Following the breakout sessions, the plenary group summarized the day's discussions:

- • In general, the existing consolidated needs and project lists are still valid, requiring only some modification and minor updating
- • With some modification, the Consolidated Needs Sheet (Appendix D, page 68) provided during the workshop could serve as a "focus lens" for addressing range sustainability R&D needs
- • Needs that have emerged, or are emerging, since that last effort to consolidate in 2002 include:
 - Improved encroachment forecasting, total impact assessment, and quantification.
 - Overseas training range development and sustainment (global repositioning).
 - Joint and shared use ranges and training areas.
 - Future force unit-collective training.
 - Virtual aspects.

- Information/integration/linkage/instrumentation.
- Weapons systems requirements and training requirements integration and coordination.
- Meaningful cost and performance data for technologies and benchmark data using best practices.
- Recovering the use of existing training lands (including those with restrictions), rather than seeking new land acquisitions.

3 Day 2 - December 10, 2004

Gaps in Transition and Implementation of R&D Technologies

The second day of the workshop consisted of an open group discussion mainly focusing on determining the gaps in the transitional and implementation issues of R&D technologies. The group identified the following gaps:

- End users are not involved early enough in the R&D process. Consequently, there is a need to keep end users engaged throughout the entire R&D process.
- Develop a forum needs to obtain full visibility into other Service and SERDP/ESTCP projects.
- Additional coordination among the Services is needed on projects to avoid potential duplication of effort.
- Identify “cream of the crop” best technologies as well as technologies that are currently available off-the-shelf.
- Research and report on relevant R&D efforts underway at other federal agencies.
- Better inform the training and testing communities on the actions of the environmental R&D community. Research updates should be provided on a regular basis, such as every 6 months. To assist in this outreach effort, conduct an assessment of the stakeholder/user community to identify the range of users to ensure all relevant stakeholders/users are reached and to better target information sources they frequent.
- Seek regulatory agency acceptance of new technologies.
- The R&D community has limited abilities to transition technologies to the end user communities, especially if they focus on the technologies’ technical merits alone. The user community needs to understand how the technology benefits them.
- The combat and material developers’ communities need to integrate environmental considerations into their planning process. Generally speaking, these issues have little to do with the military desired performance, cost, and schedule. Accordingly, limited funding prevents much consideration of environmental requirements at this point in the life cycle of a weapon system.
- Identify better forums to reach target audiences (web-site/portal/information sheets/etc.).

Following the discussion, the group highlighted a few key observations/ recommendations.

- The environmental Range Sustainment community needs to establish an improved process for identifying needs, validating requirements, and successfully transitioning technologies to the end user community (operator and testers).
- Greater integration needs to take place between operator, technical, and acquisition communities to ensure that R&D needs and requirements reflect mission needs and requirements, and that the resulting technologies meet these needs and are utilized.
- Many needs identified by past working groups are still valid, but strategic issues with respect to global repositioning, information management, and force restructure must be identified as far into the future as possible to ensure that technologies are developed in a timely manner (R&D lifecycle).
- Additional measures need to be taken by OSD to ensure that meaningful measurements (performance metrics, and benchmarking) are instituted to provide quantifiable benefits to DoD.

The group also decided to make the following recommendations to the WIPT:

- Need to identify all the stakeholders and ensure their involvement at the appropriate steps in the process, and throughout all stages of R&D.
- Internal visibility of R&D project results needs to be greatly enhanced and targeted at the user community.
- The WIPT needs to add an R&D representative to the WIPT.
- WIPT needs to establish a R&D “Advisory Group” that:
 - Is familiar with the nature of the existing sustainability related R&D projects.
 - Has connections to potential DoD organizations with funds for R&D projects.
- Promote more technical expertise on R&D at the WIPT sub-working group level.
 - Significant improvements need to be made to the transition from R&D projects to the field users/operators.
 - R&D efforts need to be included in the Section 366 and 320 reports.

Appendix A: Encroachment/Sustainability Technologies Workshop Attendees List

NAME	AFFILIATION	PHONE	EMAIL
DOD			
Bruce Beard	DUSD(IE)	703-604-0521	bruce.beard@osd.mil
Jan Larkin	DUSD(IE)	703-604-1890	janice.larkin@osd.mil
Bruce Hill	DUSD(R)/SRS	703-695-0713	bruce.hill@osd.mil
Colonel Brian Cullis	DISDI	703-604-5807	brian.cullis@osd.mil
Dan Feinburg	DISDI/CH2MHill	703-604-4616	daniel.feinberg.ctr@osd.mil
Bill Egan	DOT&E/IDA	703-845-6712	wegan@ida.org
Robert Holst	SERDP	703-696-2125	robert.holst@osd.mil
Jeff Marqusee	SERDP/ESTCP	703-696-2120	jeffrey.marqusee@osd.mil
Bradley Smith	SERDP	703-696-2121	bradley.smith@osd.mil
MARINE CORPS			
Phil Huber	Marstel-Day	703-836-8638	ph@marstel-day.com
Heidi Hirsh	HQMC	703-695-8240	HirshH@hqmc.usmc.mil
David Guhin	Malcolm Pirnie	703-425-4236	dguhin@pirnie.com
AIR FORCE			
Lynn Engelman	ILEPB	703-604-5277	Lynn.Engelman@pentagon.af.mil
Lt. Col. Jeff Cornell	SAF/IE	703-693-7705	jeffrey.cornell@pentagon.af.mil
NAVY			
Randy Cramer	ADUSD (ESOH)	301-744-2578	randall.cramer@navy.mil
Don Shaver	NAVAIR	301-757-1730	donald.shaver@navy.mil
ARMY			
David Sheets	AEPI	703-604-2310	david.sheets@hqda.army.mil
Tom Gray	Army Environmental Quality Technology Program	757-878-3090	grayj@atsc.army.mil
Bill Goran	ERDC-CERL	217-373-6735	William.D.Goran@erdcl.usace.army.mil
Mike Ackerman	U.S. AEC	410-436-1509	mike.ackerman@us.army.mil

NAME	AFFILIATION	PHONE	EMAIL
Chris Rewerts	USACE/ERDC	217-373-5825	chris.rewerts@us.army.mil
George Cushman	Army ODEP	703-601-1961	georgec@hqda.army.mil
Hany Zaghloul	ASA-I&E (ESOH)	703-602-5526	zahlh@hqda.army.mil
Audrey Webber	Army ODEP	703-601-1572	audrey.weber@hqda.army.mil
Carl Scott	SAIE (ESOH)	703-614-8464	carl.scott@hqda.army.mil
OTHERS			
Will Rowe	Booz Allen Hamilton	703-902-5229	rowe_william_jr@bah.com
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Megan Mabee	Booz Allen Hamilton	703-412-7463	mabee_megan@bah.com
Leslie Walrath	Booz Allen Hamilton	703-412-7565	walrath_leslie@bah.com
Kim Fleming	Booz Allen Hamilton	703-412-7615	fleming_kimberly@bah.com
Scott McDaniel	Booz Allen Hamilton	309-378-2015	mcdaniel_scott@bah.com
Ron Sebek	Concurrent Technologies Corporation (CTC)	814-269-2766	sebekr@actc.com

Appendix B: Speaker Presentations

Bruce Beard



Overview of Research & Development Program Drivers

Bruce Beard
Deputy Under Secretary of Defense
(Installations and Environment)



BACKGROUND

- Sustainability related R&D realm still relatively young
- Since 1999, various documents, organizations and informal meeting identified R&D requirements or needs
- Most requirements and needs focus on cleanup technology; other focus areas growing
- Many laws, regulations, directives, policies and committee “drivers” of R&D



TRAINING AND TESTING ARE MORE IMPORTANT THAN EVER

- Realistic training requires realistic training environments
- The ability to field and use advanced military technology is fundamental to U.S. warfare
- Our weapons and tactics require increasingly large battlespaces
- Readiness is perishable – Skills must be maintained through regular training
- OPTEMPO, PERSTEMPO are up; ready access to training is essential
- Use (& Modification of) Terrain is central to land warfare
- Live Fire is Fundamental to Training



***We must train as we fight;
because we fight as we train***



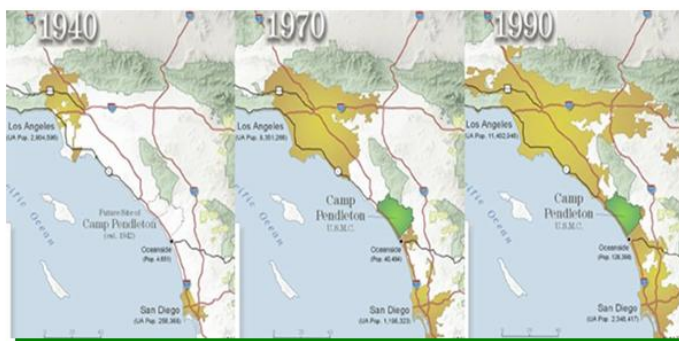
INSTALLATIONS and RANGES ARE AT RISK

Encroachment: Restrictions that inhibit accomplishment of our live training and testing as required

- Force Readiness is fundamentally linked to the quality and frequency of test and training
- The impact of encroachment is broad -- affecting our ability to execute realistic air, ground, and naval training across the nation, as well as beyond its borders.

Areas of Encroachment

- Air Quality
- Airborne Noise
- Urban Growth
- Frequency Encroachment
- Maritime Sustainability
- National Airspace System
- Endangered Species Act/ Critical Habitat
- UXO & Munitions



LEGISLATIVE DRIVERS

- **Sections 366 and 320 of NDAA require**
 - **Assessment of training constraints**
 - **Adequacy of training resources**
 - **Assessment of current and future training requirements**
 - **Impacts of encroachments on operation/readiness**
 - **Impacts due to environmental laws**

Section 366 NDAA 03 requires:

- SecDef shall develop a comprehensive plan for using existing authorities available... to address training constraints caused by limitations on the use of military lands, marine areas, and airspace that are available in US and overseas for training..
- Sec Def shall conduct:
 - An assessment of current and future training range requirements
 - An evaluation of the adequacy of current DoD resources (including virtual and constructive training assets as well as military lands, marine areas, airspace) to meet current and future training range requirements.
 - Proposal to enhance training range capabilities and address any shortfalls in current DoD resources identified pursuant to the assessment and evaluations (previously mentioned).

Section 320 NDAA 2004 requires:

- SecDef shall conduct a study of the impact of following types of encroachments
 - Civilian community encroachment on military installations and ranges; areas that may require safety or operational buffer areas
 - Compliance with CAA State Implementation Plans
 - Compliance with RCRA and CERCLA
- List of all military installations at which civilian community encroachment is occurring
- Description and analysis of the types and degrees of such civilian community encroachment
- Analysis of the current and potential future impact of such civilian community encroachment on operation training activities, research, development, test and evaluation activities and other maintenance, storage, disposal or other support functions
- A description and explanation of the trends of such encroachment as well as consideration of potential future readiness problems resulting from unabated encroachment.
- List of all military installation and other locations encountering problems related to compliance with [environmental] laws.
- Description and analysis of the types and degrees of compliance problems encountered
- An analysis of the current and potential future impact of such compliance problems on operational training activities, research, development, test and evaluation activities, maintenance, storage, disposal and other (including potential future readiness problems resulting from such compliance problems)



LEGISLATIVE DRIVERS

➤ Section 317 of FY04 NDAA allows:

NDAA allows:

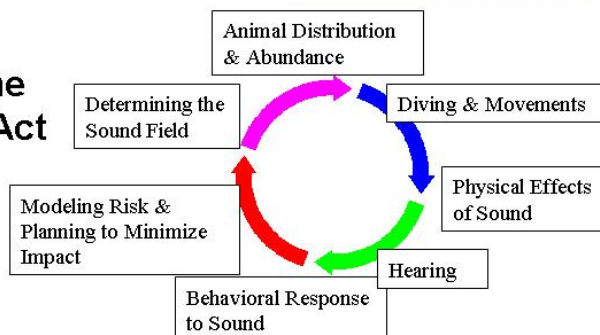
- Substitution of approved INRMP for critical habitat designation

➤ Amendment to Marine Mammal Protection Act

- Refined definition of “takings”

Effective approaches to protecting threatened species is needed to avoid critical habitat designation

"The Secretary [of Interior] shall not designate as critical habitat any lands or other geographical areas owned or controlled by the DoD, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act, if the Secretary (of Interior) determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation."



NDAA CONSERVATION PARTNERSHIP DRIVERS

➤ Sections 2811 and 2812 (from FY03 NDAA) allows DoD to:

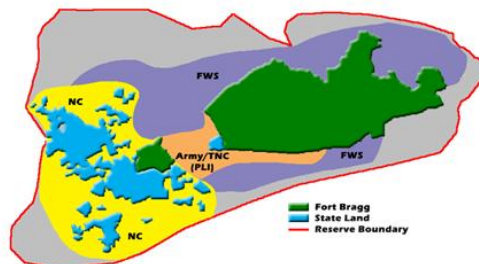
- Cooperate more effectively with private entities and state and local governments to preserve land near military installations for mission protection and conservation purposes

Buffers are one valuable approach among many in overall compatible land use to support range sustainment

➤ Services and DoD are establishing partnerships to develop buffers and promote compatible land uses

- Private Lands Initiative, Fort Bragg
- NW Florida Greenway, Eglin AFB
- NGB Camp Blanding, Florida
- Camp Lejeune
- NAS Pensacola

➤ 2005 National Defense Authorization Act includes \$12.5M to further range land protections





POLICY/GUIDANCE DRIVERS

➤ Chu Guidance -- Programmatic guidance on ranges that emphasizes:

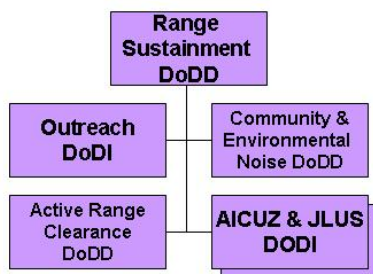
- Modernization of technologies
- Conservation of spectrum
- Development of “green” munitions
- Range Accessibility
- Outreach and Coalition building
- Range Restoration and Maintenance

P&R (“Chu Memo”) programmatic guidance outlines a comprehensive range sustainment program that will:

- Modernize range facilities to sustain range operations by resourcing advanced instrumentation and other infrastructure (spectrum efficient technologies, advanced instrumentation, C&ISR training transformation systems, best practices to minimize off-range smoke, dust, noise, munitions constituent contamination, etc.)
- Conduct range operations in consonance with comprehensive sustainability plans that integrate operational, safety, facility and environmental management functions (biodegradable inert munitions or green ammunition, interdisciplinary approach to sustainable range management)
- Maximize and sustain the availability of military ranges by resourcing for restoration and maintenance of range infrastructure and land assets (restoration and maintenance of range infrastructure and land assets, residue management, range clearance)
- Maximize the accessibility of DoD ranges by minimizing restrictions brought about by encroachment factors
- Focus the environmental management systems to fully support sustained required access to ranges (ordnance/constituents impacts, marine mammals, species baseline data, potential hazards of off-range migration of munitions constituents, etc)
- Implement sustainment outreach efforts, coalition-building and partnering on range sustainment issues important to DoD readiness (outreach information and tools)
- Pursue the development of new technologies or capabilities that support range sustainment goals and objectives



POLICY/GUIDANCE DRIVERS



➤ New Policy Under Development

- Range Sustainment Directive (Complete)
- Outreach and Stakeholder Involvement Instruction
- Community and Environmental Noise Directive
- AICUZ; Compatible Land Use Planning
- Active Range Clearance Directive
- Range Assessment Instruction
- Joint Land Use Study Instruction

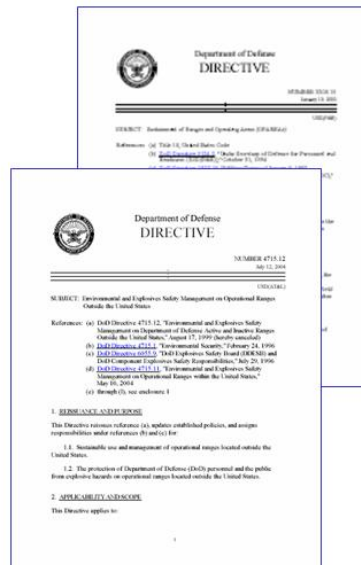
Evolving Policy Areas will Drive Range Sustainment R&D Efforts



POLICY/GUIDANCE DRIVERS

➤ DODDs (3200.15 and 4715.12) require DoD and Services to address:

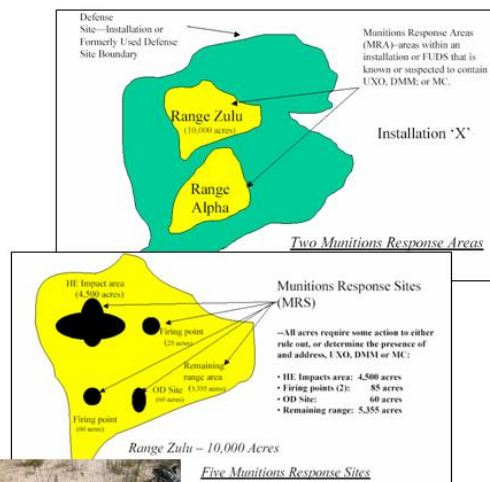
- New range lifecycle analysis
- GIS for decision-making
- Multi-tiered coordination and outreach
- Sustainment in development and acquisitions programs
- Minimize explosives hazards, resource recovery, recycling
- Environmental Impact of munitions on operational ranges
- Prevention of releases of munitions constituents off range
- Operational range clearance
- Restriction of unauthorized access to ranges and UXO areas on ranges



POLICY/GUIDANCE DRIVERS

➤ Draft DODI 4715.11 -- Operational Ranges Assessments

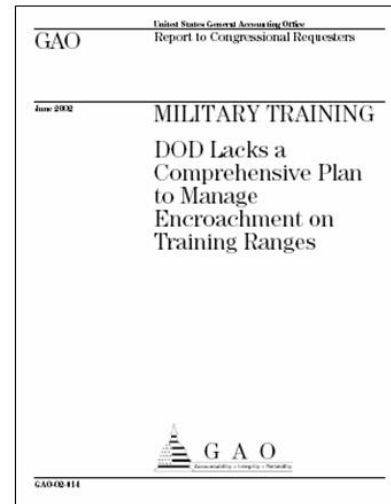
- Methodology and procedures to
 - Identify sources, pathways, and receptors
 - Determine if release poses and unacceptable risk
- Conceptual site model showing:
 - Media
 - Hydrology
 - Hydrogeology
 - Topography
 - Boundaries
 - Potential migration pathway
 - Surrounding activities





GAO DRIVERS

- **GAO June 2002**
 - Lack of documentation of encroachment
 - Lack of documentation of impact on training costs
- **GAO April 2003 – Managing Encroachment**
 - Lack of information about encroachment
 - Need for baseline of training range capabilities and requirements
- **GAO December 2003 – Approach for cleaning up Military Munitions Sites**
 - Lack of data re: military munitions sites
 - Establish cleanup goals based on relative risk
- **GAO June 2004**
 - 366 Report does not assess:
 - Training requirements
 - Adequacy of DoD resources
 - No complete identification of limits on training
 - Lack of integrated training range database for joint us
 - Needs readiness reporting system

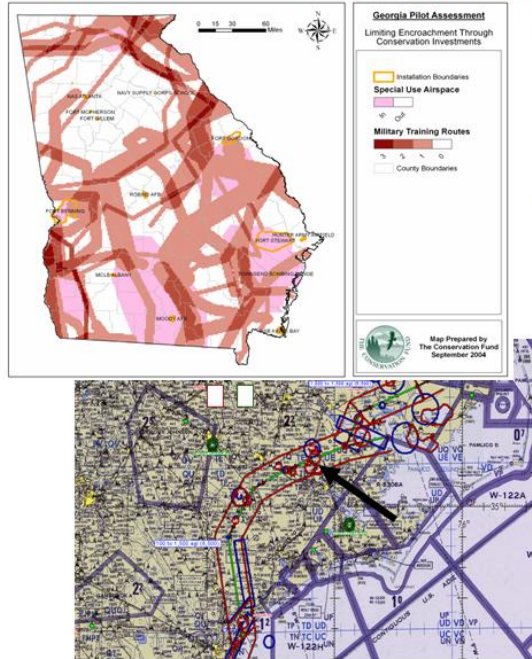


OTHER DRIVERS

- **Defense Science Board**
 - **April 1998**
 - Focus on UXO detection technology
 - Reduce false positives
 - **December 2003**
 - Use of simulation vs. live fire
 - Use of inert rounds
 - Development of Green munitions
 - Improved fuse reliability
 - Study munitions constituents
 - Modify training and range management protocols



EMERGING DRIVERS -- REMOTE OPERATING AREAS



Encroachment is affecting not only areas around the bases and ranges but other areas where forces train.

➤ What is at risk?

- Military Training Routes (MTRs)
- Military Operating Areas (MOAs)
- Low Altitude Tactical Navigations Routes (LATNR)
- Approaches to ranges and airports
- Live Weapons Corridors to ranges



MEETING OUTCOMES

- Confirmation of Needs and Projects Requirements List
- Identification of Missing Needs and Projects
- Ways to better integrate R & D into Range Sustainment initiative
- Ways to ensure R & D projects are put to use



FRIDAY OVERVIEW

- **Thursday Accomplishments:**
 - Identify gaps in R & D drivers and needs
 - Identify Gaps in R & D projects
- **Friday's Discussion Goals:**
 - How do we ensure that we are successful in transitioning R&D projects into application?
 - How to institutionalize R&D as part of the Range Sustainment Process?



PROCESS CHALLENGES PREVIOUSLY IDENTIFIED

- **Army Encroachment/Sustainability Technology Requirements Workshop (Hosted by ACSIM/ODEP) – January 2004**
 - Orchestration of encroachment technology (including a clearly define proponent)
 - User input into encroachment requirements
 - Current efforts need to be completed
 - Technology transfer of encroachment working Tools (l.e. operational emphasis)
 - Thinking about and preparing for future encroachment issues and solutions
 - Coordination and funding may be required for transition and operational use of outcomes of the current research efforts

Bill Goran

Research and Technology Programs, Projects and Requirement Needs

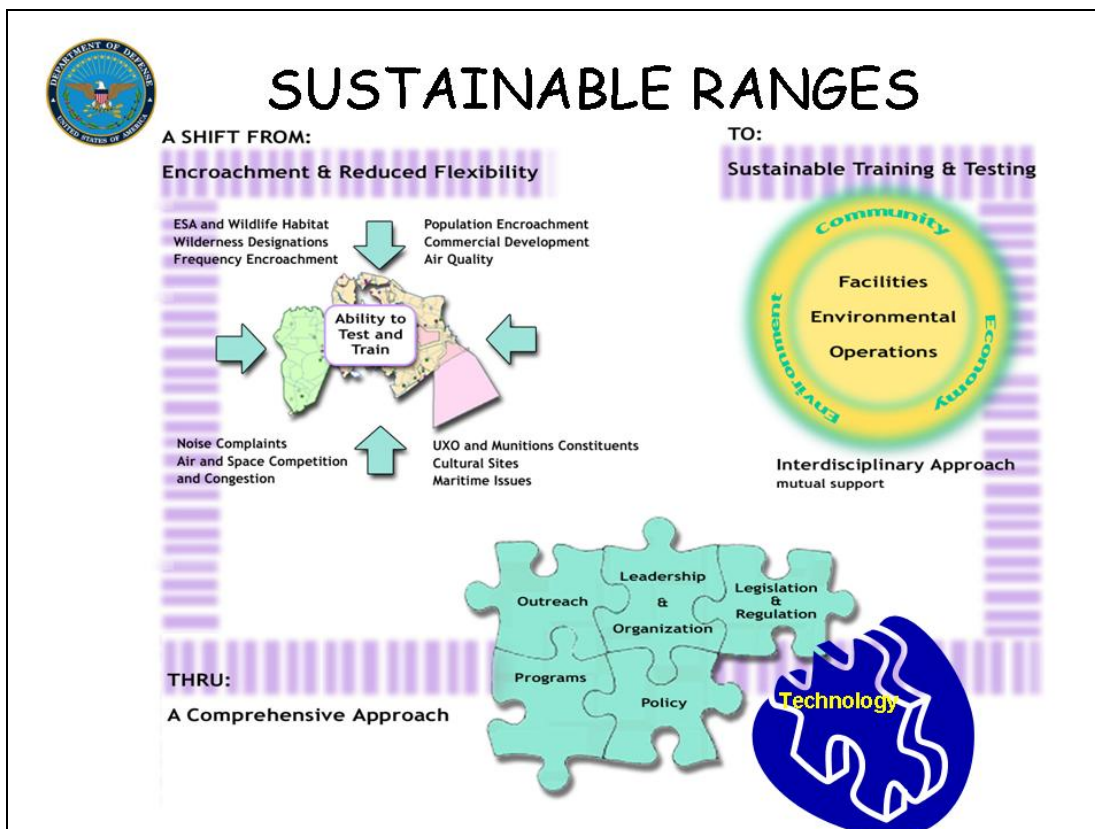
William Goran and Robert Holst

December 9, 10th, 2004

Workshop on Sustainability and Encroachment Research and Technology Requirements

Sponsored by Office of Secretary of Defense

Hosted by the Strategic Environmental Research and Development Program (SERDP)



Briefing Outline

- Programs relevant to Sustainability Requirements
- Articulated Requirements
- Looking across requirements
- Project Spreadsheets
- Requirements – emerging issues for sustainable ranges
- Incorporating Requirements into Programs
- Questions to consider relating to program, projects and requirements

RDT&E and Related Programs

Supporting all services:

- SERDP (Strategic Environmental Research and Development Program)
 - <http://www.serdp.com>
- ESTCP (Environmental Security Technology Certification Program)
 - <http://www.estcp.org/>
- NDCEE
 - <http://www.ndcee.ctc.com/>
- Legacy
 - <http://www.dodlegacy.org/legacy/index.htm>

SERDP

- Program Areas
 - Cleanup, UXO, Compliance, Conservation, Pollution Prevention
- Program Investment
 - 50 to 65 million per year
- Type of Research and Development
 - DoD 5000: 6.1 through 6.3 (basic & applied through initial testing)
- Program Operations
 - Report to DDR&E
 - Science Advisory Board
 - Involvement of EPA and DOE
 - Service leads on Pillar Teams
 - Service requirements help shape Statements of Need (SONs)
 - Competitive selection of proposals against annual SONs
 - Shared offices and management with ESTCP

ESTCP

- Program Areas
 - UXO, Cleanup, Compliance, Pollution Prevention
- Program Priorities
 - Expediting the slow pace of remediation at installations.
 - Demonstrating emerging, innovative technologies.
- Program Investment
 - 20 to 35 million per year
- Program Focus
 - DOD 5000: 6.4
- Program Operations
 - Report to DUSD (I&E)
 - Competitive selection of proposals against annual solicitation
 - Shared offices and management with SERDP

NDCEE

- Program Areas
 - Cleanings/Coatings Removal
 - Environmental Management
 - Inorganic Coatings/Organic Coatings
 - Recycle/Recover/Reuse
 - Technology Transfer Insertion
 - Treatment/Remediation
 - Special Projects
 - New Efforts in Sustainability

NDCEE

- Program Focus (all EQ pillars)
 - Demonstrations
 - Product Evaluations
 - Links to Industry
 - Technology Insertion
- Program Resources
 - Mix of Congressional Add to Defense budget
 - Army technology demonstration resources
- Program Operations
 - Oversight by Army I&E through contract (CTC)

Legacy Resource Management Program

- Not an R&D Program
- ESTCP omitted Conservation as a category in part because of Legacy, and some Legacy projects do demonstrate or transition technologies
- Program
 - Annual Solicitation
 - Service Input to project nomination and selection
 - Oversight by DUSD (I & E)

Legacy Areas of Emphasis

- **Readiness and Range Sustainment**
 - DoD's Sustainable Ranges Integrated Product Team (IPT) will review and coordinate on all proposals
- **Integrated Natural Resources Management**
- **Regional Ecosystem Management Initiatives**
- **National and International Initiatives**
- **Invasive Species Control**
- **Monitoring & Predicting Migratory Patterns of Birds & Animals**
- **Cultural Resources Management**
- **Historic Preservation and Force Protection**
- **Native American Issues**
- **Curation of Archaeological Collections, Associated Records and Documents and Management of Archaeological Sites**

Service R&D Programs

- Reliance is OSD approach to coordinate across service and OSD RDT&E efforts
- Every other year briefing to external panel (next session postponed to 2006)
- Lead assignments by service aligned with EQ Pillars
 - Army – Conservation & Cleanup
 - Navy – Compliance
 - Air Force – Pollution Prevention
- New Environmental Strategies (e.g. focus on sustainability) may require rethinking of Pillars, and R&D will adjust if/when services adjust
- Only Army and Navy have continuing program investments in EQ R&D

Navy Environmental Quality Research, Development, Testing and Evaluation RDT&E Requirements

- Need Description
- Mission Operation Impact
- Environmental Impact
- Current Cost of Problem
- Known R&D Efforts
- Alternative Options



http://navyegrqmts.nfesc.navy.mil/cgi-bin/pillar/cfpillar_results.cfm?counter=51#Book_Needs

Example Navy Requirement

- ID #: 2.IV.02.f
- Title: Protecting Marine Mammals and Threatened and Endangered Species from Acoustic Emissions
- Pillar Supported: Compliance
- Thrust: Noise – Control Emissions
- Priority: High
- Media: Water
- Contaminants: Acoustic Noise, CO
- Key Policy or Regulatory Drivers:
 - Endangered Species Act
 - Marine Protection
 - Research and Sanctuaries Act (33 USC 1401)
 - National Environmental Policy Act
 - OPNAVINST 5090.1B
- Need Description:



Army Environmental Quality Technology (EQT) Requirements

- Last updated in 2002 (update underway)
- Drive Army RDT&E investments
- Pillar Teams gather requirements from the field
- Prioritize within pillars (top 5)
- Life cycle plans developed for each top requirements

Example Army Requirement

- **I.D. #:** A (4.6.a)
- **Title:** Reducing Impacts of Threatened and Endangered Species on Mission
- **Rational:** Sustaining mission capability and compliance with laws and regulations
- **Media:** Proposed/Threatened/Endangered Species, Natural Resources, Water, Air
- **Substance/Contaminant/Pollutant:** Maneuver land disturbance, habitat, noise, smoke obscurants, contaminants
- **Key Regulatory or Policy Driver:** Endangered Species Act
- **Other Major Regulatory Considerations:**
 - Sikes Act
 - NEPA
 - Clean Air Act
 - Clean Water Act
 - State Statutes
- **Need Description:**

Army Research Requirements and Program Priorities

- **Field Operating Capabilities (FOCs):**
 - Identify desired capability in a future state (e.g. reduced heat profile, faster helicopter lift speed). Poor connection with EQT current EQT requirements (TRADOC PAM 525-66).
- **Strategic Technology Objectives (STOs):**
 - Highest prioritized RDT&E investments for 6.2 (applied) programs (200 total).
- **EQT STOs (name changing to ATOs)**
 - Ft. Future (modeling and simulation for installation planning)
 - Sustainable Ranges (environmental planning for ranges)
 - TES Mission Impact (reducing mission constraints)
 - UXO (improved discovery technologies)

Looking Across Programs

- Formal requirements processes in place for service RDT&E, needs stretching for programs for all services
- Programs investments not sufficiently transparent
- No consistent “metadata” for projects
 - SERDP Fact Sheets
 - Project Summary Sheets
- Projects difficult to track by requirement
 - Could be part of project metadata

Consolidated R&D Technology Needs in Support of DoD Sustainable Ranges, Training & Testing Operations and Readiness

- **9 areas have been identified as “common DoD needs” after evaluating key range sustainability documents and directives:**
 - SROC
 - DoD Directives
 - 366 Report
 - DoD Sustainable Ranges Programmatic Guidance
 - Etc.
- **Some of these needs require technology-based solutions, while others may require policy/management solutions.**
- **The needs fall into the following categories:**

<ul style="list-style-type: none"> ➤ Planning ➤ Infrastructure ➤ Operation ➤ Maintenance ➤ Encroachment 	<ul style="list-style-type: none"> ➤ Environmental Quality ➤ Outreach ➤ Acquisition/Technology R&D Interface ➤ Technology Transfer
--	--

**Go to project spreadsheet*

Projects Per Area

	Planning	Infrastr ucture	Operati on	Mainten ance	Encroachment	Environmental Quality	Outreach
SERDP	7	0	15	41	4	76	1
ESTCP	0	0	5	28	0	29	0
Army & Other	8	3	1	0	3	1 (many not included)	3
LEGAC Y	2	2	1	0	4	7	1
NAVY	1	0	1	6	1	8	1

SROC Criteria

Areas of Encroachment

- Endangered Species Act/ Critical Habitat
- UXO & Munitions
- Frequency Encroachment
- Maritime Sustainability
- National Airspace System
- Air Quality
- Airborne Noise
- Urban Growth
- Cumulative or Multiple Criteria

Years Required for Outcomes

Program Type	Requirements	Program Response	Research And Development	Testing & Demonstration	Transition To Operations
RDT&E	1-2	1-2	3-5	2-3	2-4?
Legacy	1	0	1-3		1-3
Operational Funds	1	0	1-3	1 to 0	1
Technology Support	0	0	<1		

Sustainable Ranges R&D Requirements Workshop

Categories of Requirements

- TES and other Species of Concern
- Land Use
- Invasive Species
- Munitions/Other Constituents
- Noise
- UXO
- Air Emissions
- Safety
- Water Quality
- Other

*Go to Requirements Spreadsheet from Sustainable Ranges R&D Workshop



OTHER ISSUES REQUIRING R&D SUPPORT*

- Improved Encroachment Forecasting Capabilities
- Overseas Training Range Development and Sustainment
 - Global Repositioning and Expeditionary Training
- Sustainment of Joint and Shared Use Ranges

* John Walsh, presentation at SERDP Symposium, December 2004

Future Force Unit / Collective Training

➤ Modify Unit Training Ranges

- ✓ Provide a Contemporary Operating Environment that replicates everything from media to paramilitary and terrorist.
- ✓ Involve Joint, Interagency, and Multi-national participants
- ✓ Link/integrate training ranges
- ✓ Provide deployable capabilities

➤ Support Current to Future Force Changes

- ✓ STRYKER Brigades
- ✓ Modular reorganization
- ✓ Live, Virtual and Constructive integration
- ✓ FCS / Unit of Action



*John Mandeville, Army Training Support Center (ATSC) Ft. Eustis, VA

Future Issues for Ranges

The next 15 years requires a great expansion in range capabilities to achieve new FF training requirements:

- **Jointness** →
- **Digital linkages**
- **Integrated with other training capabilities**
- **Reconfigurable/deployable...multi-purpose**
- **Live, Virtual, and Constructive**
- **Protecting what we have...the environment**
- **Spectrum management**
- **Airspace management**
- **Increased live-fire to wider audience**

Impacts on Army Ranges:

- Increased frequency of fast mover traffic
- MOA coordination & consideration
- Airspace deconfliction
- Planning & accommodation of weapon footprints/SDZ's
- Frequent engagements in close proximity to friendly troops
- JFIRES: Integration of numerous SDZ's footprints
- Army range control facilities must be able to integrate associated weapon safety requirements

*John Mandeville, Army Training Support Center (ATSC) Ft. Eustis, VA

11

Research and Technology Questions

- Have requirements been articulated by proponents and understood by R&D community?
- Have there been sufficient investments against these requirements?
- Are these investments timely – that is, will products be available when needed?
- Are investments balanced across these requirements?
- Are there new or emerging requirements that need to be considered?
- Are there transition issues that need to be addressed to move project results into operational use?

Backup

Consolidated R&D Technology Needs in Support of DoD Sustainable Ranges, Training & Testing Operations and Readiness

Infrastructure Needs:

- Life Cycle Planning & Design for Ranges and Support Facilities
- Resource Valuation Methodologies
- Instrumentation Technologies
- Platform Interface Technologies

**Consolidated R&D Technology Needs in Support of DoD
Sustainable Ranges, Training & Testing Operations
and Readiness**

Infrastructure Needs:

- Life Cycle Planning & Design for Ranges and Support Facilities
- Resource Valuation Methodologies
- Instrumentation Technologies
- Platform Interface Technologies

**Consolidated R&D Technology Needs in Support of DoD
Sustainable Ranges, Training & Testing Operations
and Readiness**

Operation Needs:

- Integrated Planning/Management Technologies
- Best Practices/Technologies to Optimize Range Operation
- Biodegradable/Inert/Green Ammunition
- Health and Safety Risk Assessments (explosives, etc.)
- Impact Assessments (operability, constraints, etc.)

Consolidated R&D Technology Needs in Support of DoD Sustainable Ranges, Training & Testing Operations and Readiness

Maintenance Needs:

- Restoration and Maintenance of Range Infrastructure
- UXO and Residue Identification (no cleanup/remediation)
- UXO and Residue Management (resource recovery, recycling, reuse, disposal)
- Range Clearance and Closure

Consolidated R&D Technology Needs in Support of DoD Sustainable Ranges, Training & Testing Operations and Readiness

Encroachment Needs (Includes Frequency Encroachment, Urban Growth, Demands for Airspace, Noise, Air Quality, Water Quality, Maritime Sustainability):

- Off-Range Impact Assessment Processes and Methodologies
- Off-Range Impact Mitigation Technologies (dust, noise, smoke, etc.)
- Total Encroachment Impact Assessment, Metric Development and Quantification (Required Congressional Reporting Item for 2006)
 - o Methods to Quantify Encroachment into "Resources"
 - o Methods to Quantify Impacts on Operations (scheduling, cost, work- arounds, training quality degradation, etc.)

Consolidated R&D Technology Needs in Support of DoD Sustainable Ranges, Training & Testing Operations and Readiness

Encroachment Needs (Cont.) (Includes Frequency Encroachment, Urban Growth, Demands for Airspace, Noise, Air Quality, Water Quality, Maritime Sustainability):

- Frequency Encroachment Assessment and Mitigation Technologies
- Room to Maneuver Optimization Capability Assessments/Technologies (air, ground, sea, undersea, space and frequency spectrum range requirements, re-basing and transformation requirements)
- Integrated DoD Encroachment Data Warehouse (GIS, inventory, impacts, etc.)
- Urban Growth and Development Interface Tools (land use prediction, best use assessment, etc.)

Consolidated R&D Technology Needs in Support of DoD Sustainable Ranges, Training & Testing Operations and Readiness

Outreach Needs:

- Community Outreach/Communication Tools
- Outreach/Communication Effectiveness Assessment Processes (Market Research, Branding research, focus groups, etc.)
- Regional Development Interface Tools

**Consolidated R&D Technology Needs in Support of DoD
Sustainable Ranges, Training & Testing Operations
and Readiness**

Acquisition/Technology R&D Interface Needs:

Need for coordination with weapons systems PEOs, PMs and DoD acquisition community to ensure seamless integration on weapons systems capabilities and requirements with range sustainability standards and requirements

**Consolidated R&D Technology Needs in Support of DoD
Sustainable Ranges, Training & Testing Operations
and Readiness**

Technology Transfer Needs:

Ensure efficient validation and transfer of R&D products (technologies) to installations for integration into operations

Ensure efficient and standardized means to communicate R&D products to operational users at installations

Consolidated R&D Technology Needs in Support of DoD Sustainable Ranges, Training & Testing Operations and Readiness

Environmental Quality Needs (Includes UXO, Endangered Species, Air Quality, Water Quality, Emission On/Off-Range, Maritime Sustainability):

- UXO, Ordnance, Constituent Impact Assessments (potential release on- and off-range) (No Remediation/Cleanup)
- Development of Training Simulator Munitions for Use on Ranges to Replace DU/submunitions Use
- Threatened/Endangered Species Assessments/Technologies (includes marine mammals/underwater noise, etc.)

Bob Holst



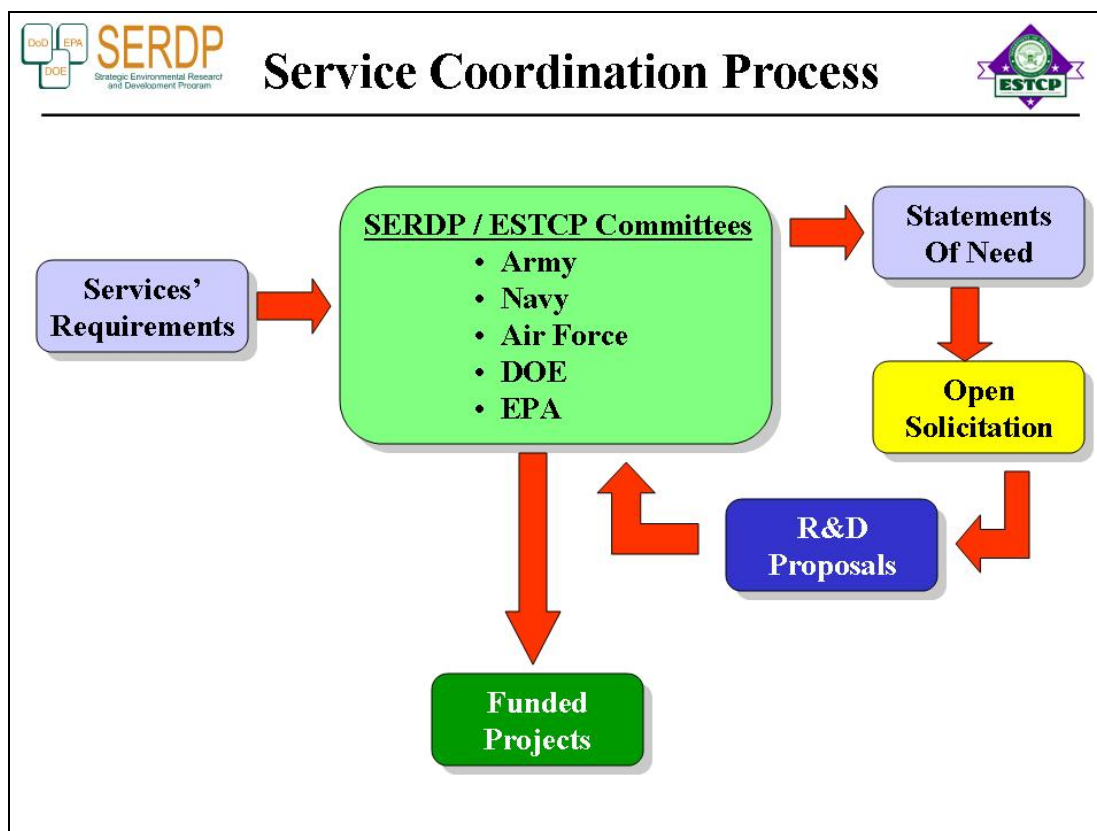
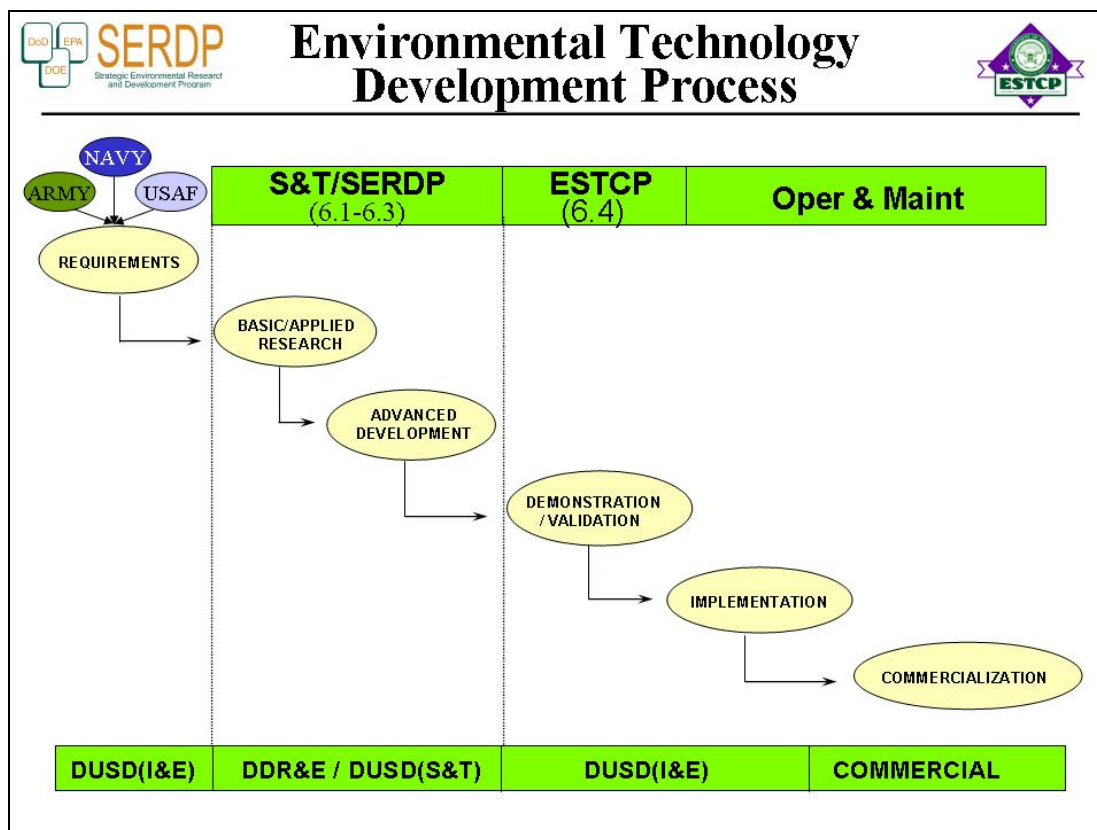
SERDP and ESTCP



DoD's Corporate Environmental Technology Programs



- **Basic and Applied Research**
- **Demonstration / Validation**





Environmental Drivers



Sustainability of Ranges and Range Operations



**Maritime Sustainability
Threatened and Endangered Species**



Toxic Air Emissions and Dust

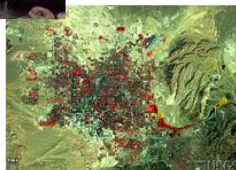


**Unexploded
Ordnance**



**Urban Growth &
Encroachment**

Noise

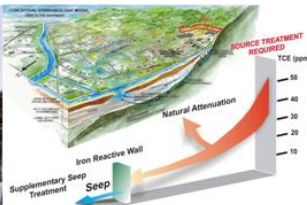


Environmental Drivers



Reduction of Future Liability

Contamination from Past Practices

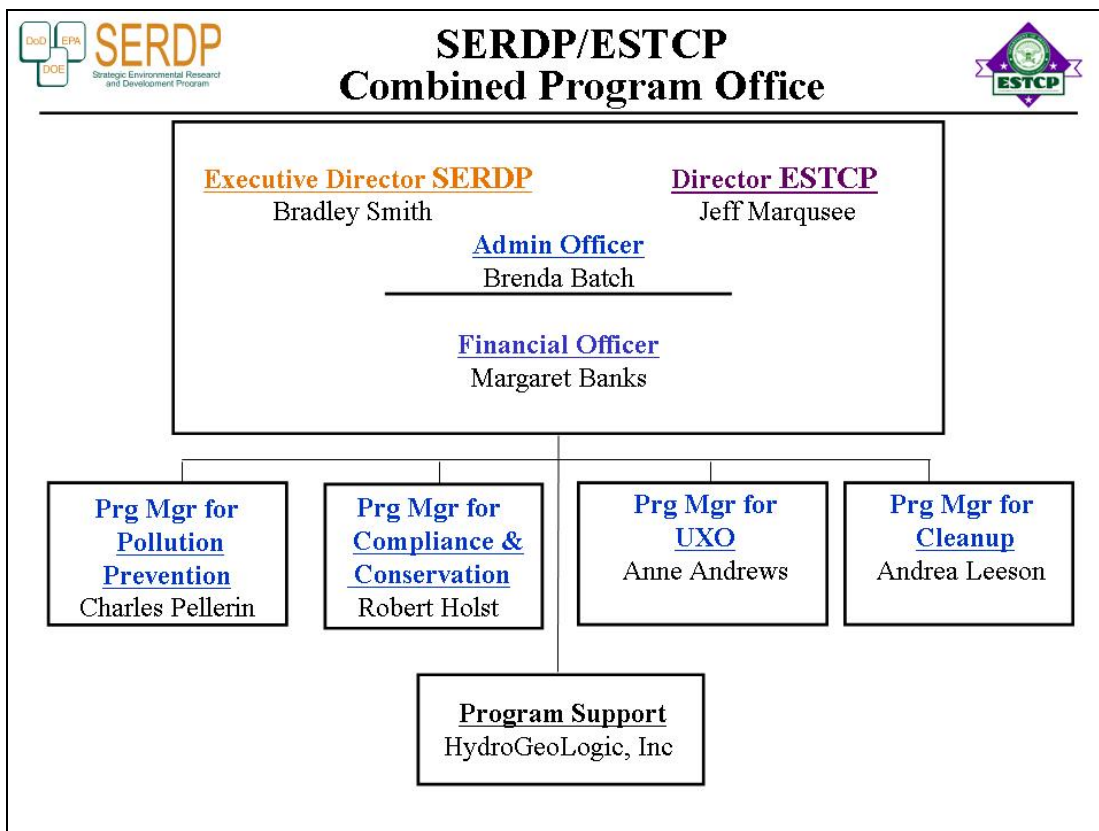


Pollution Prevention to Control Life Cycle Costs



- Chlorinated Solvents Remain Intractable
- Large Potential UXO Liability
- New Contaminants Emerging (Perchlorate)

- Elimination of Hazardous Materials Reduces Cost of Operation, Repair & Demil
- Goal is to achieve Compliance Through Pollution Prevention





Strategic Environmental Research and Development Program



- **Established by FY 1991 Defense Authorization Act**
 - **DoD, DOE and U.S. EPA partnership**
- **Purposes**
 - **Address DoD and DOE environmental concerns through R&D**
 - **Share data collection and analysis capabilities**
 - **Identify and share DoD research technology**
 - **Identify private sector technologies useful to DoD**



SERDP Method



- **Annual Solicitations to Meet DoD Needs**
 - **Two Solicitations**
 - **Open to All: Government, Academia, Industry**
- **Competitive Award**
 - **External Peer Review**
 - **Internal and Scientific Advisory Board Review**
- **Transition to Demonstration/Validation**



Research and Development



- **R&D up through Proof of Principle**
 - **Basic Research**
 - **Applied Research**
 - **Technology Development**
- **“Nominal” Project**
 - **3 to 5 years in length**
 - **Costs range from \$100 K to \$500 K per year**
 - **Multiple Partners**



Environmental Security Technology Certification Program



PROGRAM GOALS

- **Demonstrate innovative cost-effective environmental technologies**
 - **Capitalize on past investments**
 - **Transition technology out of the lab**
- **Promote implementation**
 - **Direct technology insertion**
 - **Gain regulatory acceptance**

Priority: needs of the DoD user community



ESTCP Method



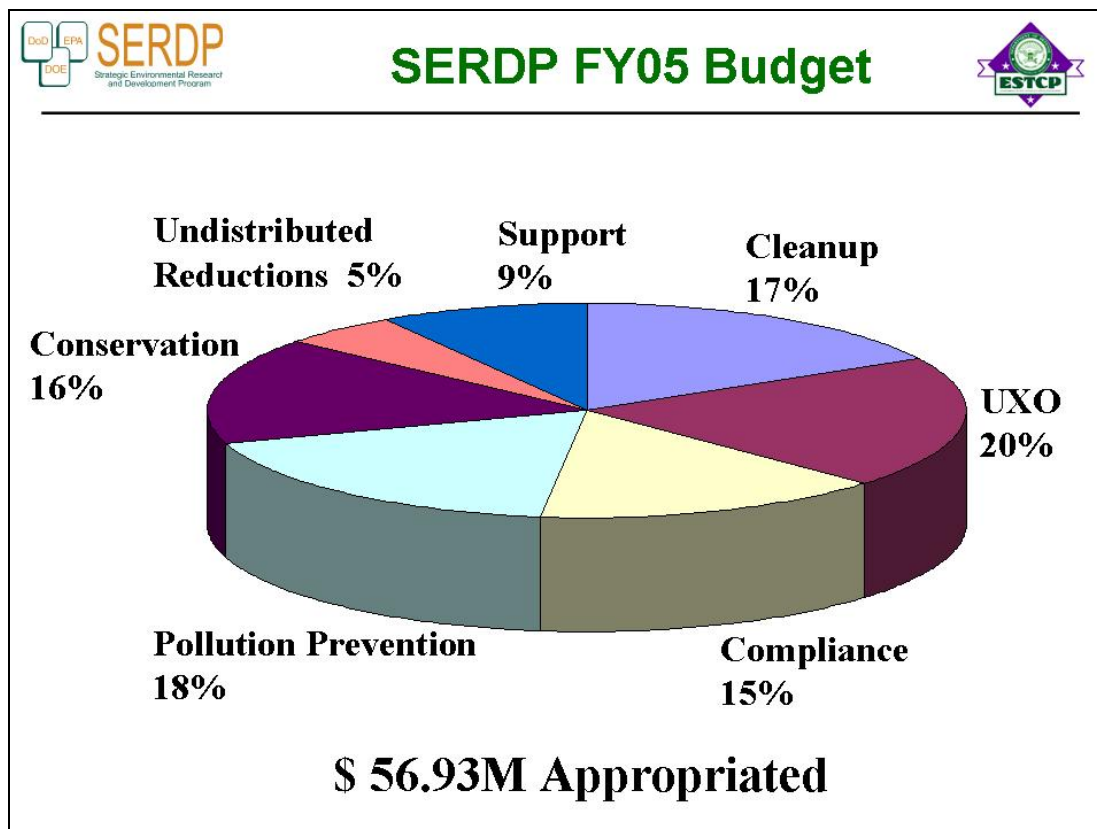
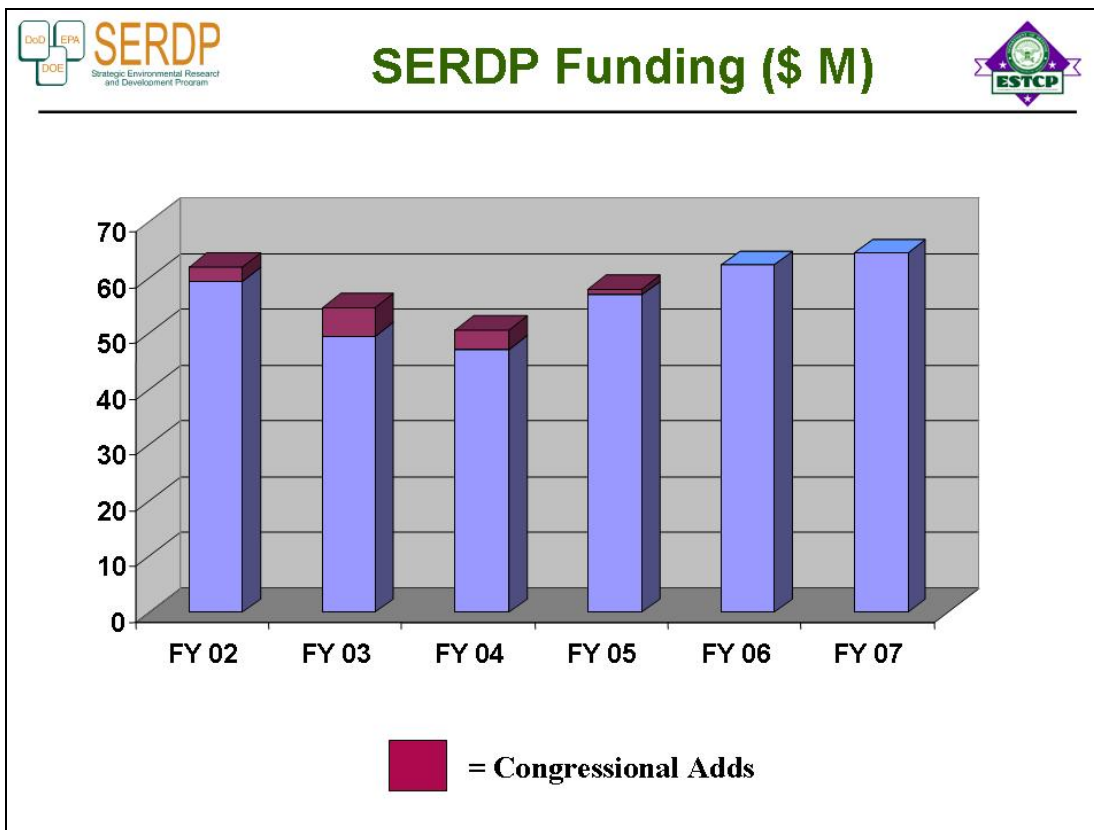
- **Partner with stakeholders and test at DoD facilities**
 - **Developer, regulators, end-user**
 - **Direct transition**
- **Validate operational cost and performance**
 - **Independent test and evaluation**
 - **Satisfy regulatory and user communities**
- **Identify DoD market opportunities**
 - **Technology transfer across federal and private sector**

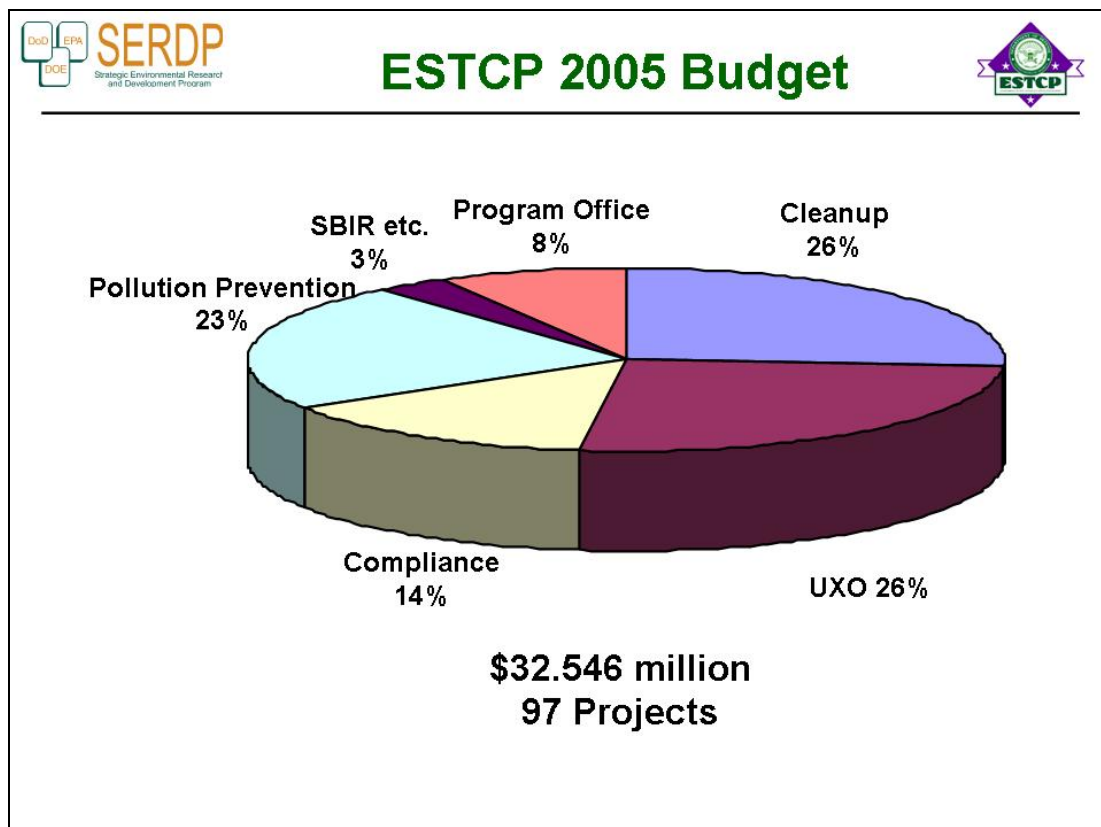
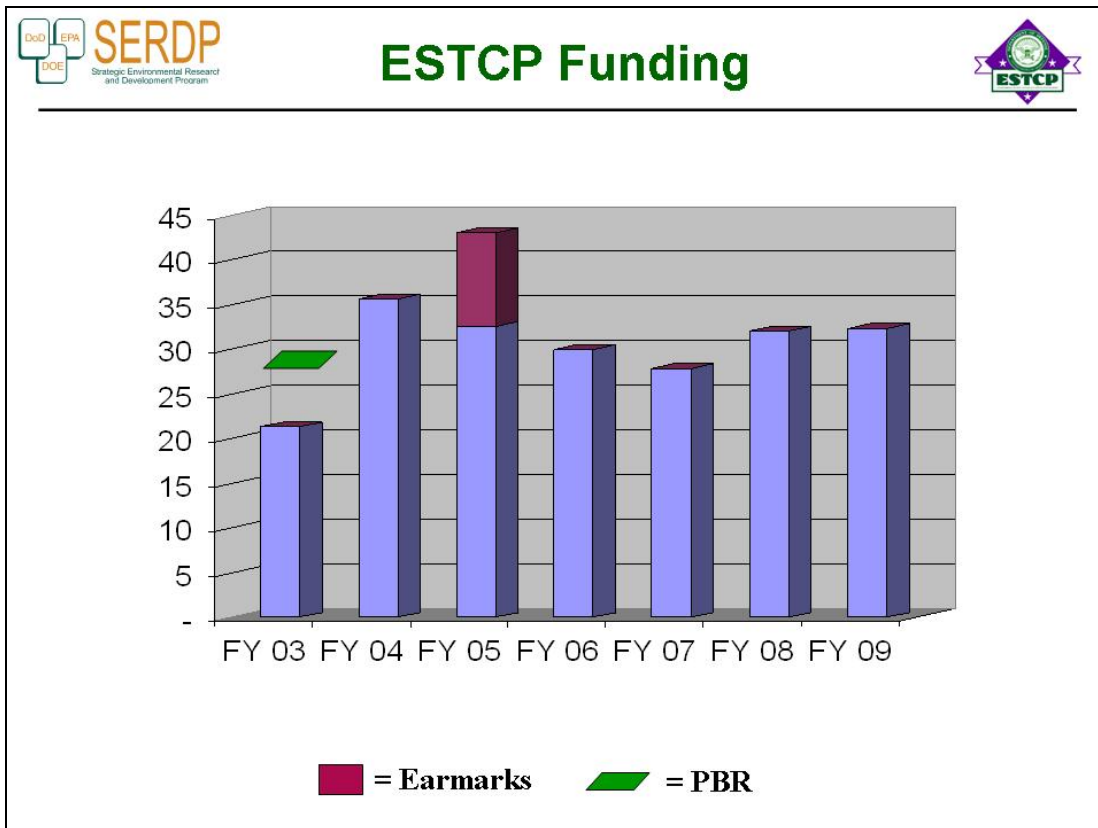


Demonstration/Validation



- **Demonstration scale and scope**
 - **3 years or less**
 - **Limited development**
 - **Assess full scale cost and performance**
- **Validation**
 - **Technical performance**
 - **Operational costs and logistics**
 - **Regulatory and/or end user acceptance**







Solicitation Timelines



SERDP

- Annual Solicitation - November
- “SEED” Solicitation - November
- Selection in July
- SAB Reviews in August/September

ESTCP

- Annual Solicitation - January
- Selection in September



**Sponsored by
SERDP and ESTCP**



Partners in Environmental Technology

Technical Symposium and Workshop

November 29 – December 1, 2005



**Marriott Wardman Park Hotel
Washington, D.C.**



Home Pages



<http://www.serdp.org> <http://www.estcp.org>



BACKUP SLIDES



FY06 Cleanup SONs



- **Improved Understanding of the Distribution and Impacts of Subsurface Remedial Amendments in Groundwater**
- **Development and Placement of Amendments for In Situ Remediation of Contaminated Sediments**
- **Assessment and Measurement of Processes Impacting the Fate and Transport of Contaminants in Sediments**
- **Containment/Treatment of Energetic and Propellant Material Releases on Testing and Training Ranges**



FY06 Compliance SONs



- **Range Environmental Fate for Energetic Materials**
- **Range Environmental Transport Exposure Assessment for Energetic Materials**

SEED

- **Development of Miniaturized Sensors to Monitor or Determine Environmental Parameters**



FY06 Conservation SONs



- **Examination of Endangered and Threatened Species Habitat Fragmentation Issues On and In the Vicinity of DoD Installations**
- **Restoration of Longleaf Pine for Red-Cockaded Woodpecker Habitat**
- **Methodology for Scientifically-Defensible Population Recovery Goals for Listed Species**

SEED


- **Innovative Conservation Initiatives in the Areas of Integrated Natural Resource Management, Invasive Species Control, and Cultural Resources Management**




FY06 Pollution Prevention SONs




- **Reduction/Elimination of Non-Hazardous, Solid Packing Waste**
- **Environmentally Benign Runway Deicing**
- **Environmentally Benign Synthesis of Energetic Compounds and Their Precursors**
- **Environmentally Benign Finishing/Coating Systems for DoD Substrates**







SERDP
Strategic Environmental Research
and Development Program




FY06 Unexploded Ordnance SONs

- **Development of Innovative Signal Processing:
Exploitation of Geophysical Data Collected at the UXO
Standardized Test Sites**
- **Sensor Phenomenology of Unexploded Ordnance in
Underwater Environments**
- **Innovative Technology for Wide Area Assessment of Sites
Potentially Contaminated with Unexploded Ordnance**
- **Development of Handheld and Man-Portable Platforms
Supporting Geophysical Surveys of Unexploded
Ordnance Contaminated Sites**
- **Innovative Technology for Detection, Discrimination, and
Remediation of Unexploded Ordnance**





SERDP
Strategic Environmental Research
and Development Program



Technical Areas

<p style="text-align: center; color: green;">Cleanup</p> <ul style="list-style-type: none"> ◆ Site Characterization ◆ Remediation ◆ Monitoring <p>➔ <i>protect communities & reduce cleanup costs</i></p>	<p style="text-align: center; color: green;">Compliance</p> <ul style="list-style-type: none"> ◆ Emission Monitoring/Control ◆ Noise Compliance ◆ Waste Disposal ◆ Range Management <p>➔ <i>reduce impact on operations</i></p>
<p style="text-align: center; color: green;">Unexploded Ordnance</p> <ul style="list-style-type: none"> ◆ Site Characterization ◆ Remediation ◆ Cued Identification <p>➔ <i>risk & costs reduction</i></p>	<p style="text-align: center; color: green;">Pollution Prevention</p> <ul style="list-style-type: none"> ◆ Alternative Maintenance ◆ Alternative Manufacturing ◆ Material Substitution ◆ Recycling/Reuse <p>➔ <i>reduce mission impacts & improve readiness</i></p>



- **Perchlorate Add** - technologies for treatment of perchlorate-contaminated groundwater
 - Call for Proposals Issued 10/12/04
 - 40 Pre-Proposals Received 11/18/04
- **Wide Area Assessment** - technologies suitable for wide area assessment of UXO-contaminated sites
 - Issued Call for Proposals 11/18/04
 - Pre-Proposals Due 12/22/04
 - For details –
www.estcp.org/opportunities/solicitations



- ◆ **Call for Dem/Val Projects: January 2005**
 - address DoD environmental requirements
- ◆ **Competitive Two Phase Process**
 - DoD lead
- ◆ **Phase I: Technology Selection**
 - short written pre-proposal
 - modifications recommended
- ◆ **Phase II: Final Prioritization**
 - full proposal
 - oral presentations
 - forge partnerships



ESTCP BAA 06 Creating Partnerships



- ◆ **Call for Technologies: January 2005**
 - selected topic areas
- ◆ **Pre-proposal White Papers**
 - short written pre-proposal
 - competitive process
 - technology down select
- ◆ **Identify DoD Partners**
 - develop Dem/Val project
- ◆ **Dem/Val Review: Final Prioritization**
 - full proposal
 - oral presentation

Appendix C: Need Statements from the 2002 Sustainable Range Workshop

T & E Species and Other Species of Concern
Need ways to extrapolate data from one species to another (with caution).
Need to expand upon research to address startling impact of flyovers, link to physiological stress of organism and behavioral monitoring.
Need to export biodiversity (i.e., processes for recovery of endangered species off of military lands such as corridors).
Need to determine how smoke pots affect endangered species. Services have stopped using smoke pots due to potential impact to environment, incomplete combustion and components may move to groundwater. Effects on plover populations, nesting etc.
Need to train with and test aircraft (helicopters, ground equipment, and arms). Noise, nighttime and low level flying requirements are concerns. Supersonic flight areas are limited. Local community impacts ability to meet requirements. Requirements mandated by state, counties, and cities that control zoning. Effect of noise and other training on TES and livestock during nighttime flights, flare use, rockets, etc. Not sure how to study the effects on TES and livestock during nighttime activities. No scientific assessment to counter changes imposed by high level authority in the Service. Need to identify how flyovers affect nesting of TES and how can we gain access to past and current studies to make decisions. Need database or library on TES effects that can be used across the services.
Need to know how training affects wildlife habitat on ranges. Lack of science to help make the self-imposed decisions on potential impacts. Need a broader range of scientific effort on how training impacts the wildlife when migrations occur. Special considerations during periodic migrations need to be addressed. Need to understand the impacts broadly across the habitat not only focusing on TES. Improve assessment tools to continue or implement ongoing monitoring programs.
Need to determine why/how sea turtles die (cause of death).
Need a better understanding of military impacts to essential fish habitat.
Need rapid assessment techniques for coral reef health that discern military impacts from other anthropogenic effects. Impacts are self-imposed restrictions due to lack of monitoring and science.
Need a way to do an effective wildlife survey. Evaluate use of remote sensing for wildlife surveys. Include marine resource assessments.
Need to improve risk assessments and prioritization methods for species and habitat on ranges.
Need to determine what constitutes Level B harassment (Marine Mammal Act). Need common standards for infrequent events (e.g., shock test). Need to determine impact of military missions (e.g., mid-level frequency active sonars) on marine mammals. Need to develop better techniques to detect marine mammals to prevent vessel collisions (shipstrikes).

Land Use
Need for programmatic coverage for training activities (e.g., standards across species and regions). Need regional planning tool (especially related to Section 7 consultation). Need for research to develop programmatic decision tool that can be applied to multiple ranges.
Need for future planning tools to optimize land uses inside and outside installations.
Need ability to categorically exclude (catex) training activities using scientifically-based large data pools from NEPA documents.
Need to explore optimizing use of ranges by evaluating processes to meet readiness requirements - e.g., doctrinal changes.
Need for better road design (hydrologic displacement/disruption) that take into account slopes and soil erosion/sedimentation.
Need for better information regarding historic dumping areas in sea ranges (EPA, regs, public) - typically found in deepest water.
Need capacity models related to thresholds for activities on ranges (what are ranges capable of supporting, prevention) - sea ranges.
Assess rate and future impacts of urban growth on neighboring lands. Better forecasting of future encroachment problems.
Need a regional data management system for ranges.
Need for local data management at the range level. Both environmental and activities/resources. Comprehensive plan for the complete range use.
Need a means to manage the information necessary to support comprehensive range sustainability plans. Tie in a variety of elements including: TRI, groundwater effects, ordnance location, populations densities, mitigation measures, quantification of encroachment impacts on training and testing. Assemble a data management system that can be used by operators for their specific mission requirements.
Invasive Species
Need ways to rid installations of non-native, invasive plants and animals (measures to control - bio/viruses and mechanical) and prevent their introduction. Need to determine the relationship to fire-proofing, migration, detection techniques, and metrics for success.
Need a tool to remotely detect, monitor, and predict the presence/absence of sensitive non-invasive species.
Need to determine how to prevent invasive species from impacting training and testing missions. (e.g., Japanese Sedge in dunes, thistle, nap weed, salt cedar, scotch broom, kudzu). Invasive species impact fire regime and wetlands. Some invasives interfere with training such as scotch broom. Invasives can cause dune erosion and loss of beach testing/training areas.

Munitions/Other Constituents	
Need for detection/spotting of training munitions (specific to residues and fires/hotspots)	
Need for knowledge re: migration (Fate & Transport) of residues from training munitions, the ecotoxicity of metals on small arms ranges (e.g., volume of lead), historical activities on small arms ranges (e.g., perchlorate)	
Need to identify impact of fires on the migration of tracer elements in training munitions.	
Need for non-flammable tracer element in training munitions.	
Need to determine how open detonation residue from C4 is contaminating groundwater - RDX detected in groundwater.	
Need for environmentally friendly, realistic targets for full-scale munitions (e.g., containment).	
Need for better understanding of munitions' impact on sea ranges - associated with Clean Water Act.	
Need analysis of munitions residues, taking into account degradation over time with/without intervention - fate and effect - so that a range commander can use the information.	
Need to characterize emissions and constituents of ordnances (i.e., fate and transport and effect). Local community issues need to be addressed especially related to DU and HE and cluster munitions. Need better modeling for constituents in all environments. Best available science is not always available.	
Need to understand the fate and transport of metals from ordnance.	
Need better ways to manage spent ordnance for leave-in-place scenarios, soils effects, etc. Current tools are not meeting the needs for maintenance.	
Need to train with munitions in marine environments. Impact on marine environments both long term and acute. Need to identify the type of contaminants that end up in food chain. Lack of clear science on fate and transport issues.	
Need non-toxic munitions. Issue relates to cradle and grave. Include large caliber to primers.	
Need a weapons inventory - cluster bombs causing many fragments on ranges. Need to minimize impact of fragment dispersion through development of inert rounds, self-destructing submunitions, and wide-area screening tools for submunition ranges.	
Need a less intrusive way to detect presence of munitions residue for surface clearance.	
Need for field screening methodologies for energetics.	
Need for more research on environmental impact of ballistic of munitions (various soil densities...) - (SafeRange)	
Need a centralized data collection system to determine cumulative effect of weapons systems, including foreign (new to installation). Need adequate component and emission data. Need the ability to access data quickly for site-specific studies.	
Need improved methods to dispose and reuse/recycle range scrap. Need to come up with methodologies to eliminate range scrapes and propellants.	
Need to identify environmental design requirements to construct a facility that would process range residues (munitions and targets) - design for treatment of waste streams as well.	

Noise	
Need to have noise modeling more accessible to range community (not user friendly at this time).	
Need to provide a noise modeling tool kit to range community.	
Need for research to identify standards for quantifying noise in rural/desert areas (people issue). Need to interpret noise models that take into account single events to augment cumulative metrics (assess impacts). Need to quantify/define 'typical day'. Need to have more consistent use of metrics for noise assessment.	
Need better understanding of transmission of low-frequency waves through the ground and its effects on structures in the distance (many miles away).	
Need noise mitigation for weapons/aircraft.	
UXO	
Need for improved options for removal of underwater UXO, where required.	
Need for inert training rounds and/or self-destructing sub-munitions.	
Need for wide area screening tools for submunitions.	
Improved methods for safer range clearance (e.g., unmanned or robotics).	
Air Emissions	
Need to determine the restrictions on ranges from burning activities due to the PM2.5 requirements. Prescribed burning may contribute to the PM2.5 requirements if combined with other smoke/dust related activities. Restrictions placed on range burning due to UXO because of unknown/perceived emissions/risk etc. Need to consider State restrictions and county restrictions, often need state smoke permits.	
Need to minimize dust from training activities. PM10 is often exceeded. Not able to use optics and laser systems due to high concentrations of dust, air pollution, and obscurants. Multi-service and multi-activities impacted.	
Need to distinguish on-site and off-site sources of dust.	
Need to determine limitations on using smoke from smoke generators for active training due to state air quality requirements. Includes a 3km buffer. Use of graphite in fog oil may not meet the PM2.5 requirements (2005 Req.). Issues with air quality and opacity.	
Need to have fire-proof landscapes. Need to reduce fuel loading to comply with 2.5 air emissions standards.	
Safety	
Need to increase safety of air to ground ranges (e.g., certify ranges for aviation units to use laser-guiding tactics).	
Need to control access to ranges from outside communities. Impacts image of services. Better monitoring and exclusion technologies.	
Water Quality	
Need to evaluate effects of erosion on ranges: non-point source, effects on natural drainages, etc. Need to improve best management practices related to military activities. Erosion can impose a safety risk during maneuvers. Need to understand contribution from ranges to receiving waters. Clean Water Act 303(d). Current BMP's may conflict with training needs.	
Need for sampling and analysis methods with regard to TMDLs for on-site and off-site sources.	
Need to identify sources of heavy metal (copper, zinc) discharges/toxicity and measures to control - stormwater standards - design of collection devices from piers, runways... - issue of cost.	

Other
Need for R&D to develop pest-control measures (spray/paint) for range infrastructure that prevent damage to military equipment by animals without harming the animals.
Need for better training for range managers on environmental issues.
Need to develop cost/benefit and risk analysis on R&D money spent in the past.
Need to rapidly integrate emerging technologies into range management.
Need environmentally benign fuels.
Need rapid and cost-effective identification of cultural resources. Broad and localized.

Appendix D: Consolidated Needs Sheet

Consolidated Needs for Identification of R&D Technology Requirements in Support of DOD Sustainable Training and Testing Operations and Readiness

The items below are “needs” identified by DoD working groups and steering committees (SROC, DoD Directives, 366 Report, DoD Sustainable Ranges Programmatic Guidance, SERDP, etc.). Some of these needs require technology-based solutions, while others may require policy/management solutions. The intent of this document is to serve as a starting point for identifying specific R&D requirements for DoD technology needs in support of sustainable training & testing operations and readiness.

1. Planning
 - Regional sustainability planning (stakeholder engagement, resources negotiations, regional problem solving, regional “measures” of success)
 - Linkages across installation plans
 - Linkages between plans and mission
 - Linkages between installation plans and community impacts
 - Linkages between community plans and installation impacts.
2. Infrastructure
 - Life Cycle Planning & Design for Ranges and Support Facilities
 - Resource Valuation Methodologies
 - Instrumentation Technologies
 - Platform Interface Technologies.
3. Operation
 - Integrated Planning/Management Technologies
 - Best Practices/Technologies to Optimize Range Operation
 - Biodegradable/Inert/Green Ammunition
 - Health and Safety Risk Assessments (explosives, etc.)
 - Impact Assessments (operability, constraints, etc.).
4. Maintenance (Includes UXO)
 - Restoration and Maintenance of Range Infrastructure

- UXO and Residue Identification (no cleanup/remediation)
 - UXO and Residue Management (resource recovery, recycling, reuse, disposal)
 - Range Clearance and Closure.
5. Encroachment (Includes Frequency Encroachment, Urban Growth, Demands for Airspace, Noise, Air Quality, Water Quality, Maritime Sustainability)
- Off-Range Impact Assessment Processes and Methodologies
 - Off-Range Impact Mitigation Technologies (dust, noise, smoke, etc.)
 - Total Encroachment Impact Assessment, Metric Development and Quantification (Required Congressional Reporting Item for 2006).
 - Methods to Quantify Encroachment into “Resources”
 - Methods to Quantify Impacts on Operations (scheduling, cost, work-arounds, training quality degradation, etc.)
 - Frequency Encroachment Assessment and Mitigation Technologies
 - Room to Maneuver Optimization Capability Assessments/Technologies (air, ground, sea, undersea, space and frequency spectrum range requirements, re-basing and transformation requirements)
 - Integrated DoD Encroachment Data Warehouse (GIS, inventory, impacts, etc.)
 - Urban Growth and Development Interface Tools (land use prediction, best use assessment, etc.).
6. Environmental Quality (Includes UXO, Endangered Species, Air Quality, Water Quality, Emission On/Off-Range, Maritime Sustainability):
- UXO, Ordnance, Constituent Impact Assessments (potential release on- and off-range) (No Remediation/Cleanup)
 - Development of Training Simulator Munitions for Use on Ranges to Replace DU/submunitions Use
 - Threatened/Endangered Species Assessments/Technologies (includes marine mammals/underwater noise, etc.)
 - On- and Off-Range Air Quality and Water Quality Monitoring and Emissions Mitigation Technologies
 - Ecosystem Fragmentation Assessments/Technologies
 - Integrated Environmental Range Sustainability Management Technology.
7. Outreach (encompasses all SROC criteria):
- Community Outreach/Communication Tools
 - Outreach/Communication Effectiveness Assessment Processes (Market Research, Branding research, focus groups, etc.)
 - Regional Development Interface Tools

8. Acquisition/Technology R&D Interface – to be coordinated with weapons systems PEOs, PMs and DoD acquisition community to ensure seamless integration on weapons systems capabilities and requirements with range sustainability standards and requirements.
9. Technology Transfer – Ensure efficient validation and transfer of R&D products (technologies) to installations for integration into operations.

Appendix E: Draft of the Endangered Species Act Encroachment Action Plan

Issue Definition

Military lands provide excellent habitat for over 300 Federally listed threatened or endangered species that must be protected under the Endangered Species Act (ESA). Many installations are surrounded by urban development and are frequently the only large undeveloped areas remaining which support endangered species. Frequently military installations have become the only large undeveloped areas remaining in local urban areas as private development continues unabated. Until recently, the Services did not pay much attention to development “outside-the-fence” (the exception being the AICUZ program) and we were ignorant of how this development around us would result in our installations being the biodiversity “ark” for many localities. DoD is the 5th largest federal land owner, yet is by far the holder of the greatest known biodiversity on a per acres basis of all federal agencies.

New weapons systems are being introduced with increased stand-off, survivability and lethality capabilities. War fighting strategies are changing to more widely dispersed, highly mobile units with very long-range firepower. BRAC closures have resulted in the relocation of units to remaining bases. Also, forces stationed overseas have been redeployed to U.S. bases. As a result, military range usage is increasing.

As land use restrictions increase in order to protect endangered species, the flexibility to use our land for testing and training is reduced. If constrained much more, critical DoD military missions will be jeopardized.

As stated in Section 2 of ESA, it is “the policy of Congress that all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purpose of this Act.” ESA requires:

- Section 4(a) - U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) to list species that are at risk of becoming extinct
- Section 4(b)(2) - FWS and NMFS to designate critical habitat for a listed species when doing so is judged to be “prudent and determinable”
- Section 9 - that it is unlawful to “take” a listed species, which includes significantly modifying or degrading the species habitat
- Section 7(a)(1) - Federal agencies to utilize their authorities for the conservation of listed species
- Section 7(a)(2) - Federal agencies must ensure, through consultation with the FWS or NMFS, that any action they authorize, fund or carry out does not jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat.

In compliance with court orders, FWS and NMFS recently accelerated critical habitat designation procedures for several species; military installations and lands over which military aircraft fly are included in these proposals. Though habitat occupied by a listed species is protected under ESA, designation of critical habitat can include suitable unoccupied habitat for a listed species. Without designation as critical habitat, unoccupied habitat does not warrant protection under ESA. As the goal of ESA is recovery of listed species, Federal agencies are mandated to use their authorities to recover species on lands they administer even when conservation efforts may be at odds with the mission of a Federal agency. Critical habitat designations have the potential to reduce flexibility of military land use and hinder an installation from meeting its mission requirements. The challenge presented by ESA and critical habitat is to ensure readiness testing and training requirements are met while ensuring listed species and designated habitats are not adversely affected and recovery of listed species is simultaneously accomplished.

ESA includes a provision that would exempt DoD from ESA compliance when the Secretary of Defense finds that an exemption is necessary for reasons of national security. No Secretary of Defense has ever invoked this provision. The provision is of minimal utility because it would require the Secretary of Defense to conclude that ESA compliance will so undermine training and/or testing, and consequently national security that the Department ought to be free to undertake actions that are likely to jeopardize the continued existence of a listed species. Political reality and public perception make it very unlikely that any Secretary of Defense will invoke this provision unless faced with a national security exigency of considerable dimension.

Much is known regarding the presence of listed species on military lands. The Services have conducted inventories of their lands, at a cost of about \$2M per year, for the last 10 years; most installations support one or more listed species. However,

most of these inventories only focus on the presence of listed species on military lands. Very little information is available addressing the affect of military activities on sensitive biological resources. Further, incomplete information is often used by FWS and NMFS during listing determinations. In the absence of information, FWS and NMFS are forced to be conservative on the side of biological resources. As a result, the burden is placed on testers and trainers to modify their activities in order to avoid impacts to listed species.

In a couple of instances, the Services were able to collect information regarding impacts of military activities on listed species and species being considered by FWS for listing as endangered, and in establishing partnerships with environmental advocacy groups and regulatory agencies for the management of sensitive resources:

- Merriam's Bearpaw Poppy - a desert wildflower restricted to southern Nevada and adjacent regions of California that formally was listed as a candidate threatened species. As part of the Air Force's botanical inventory work at Nellis Range, numerous new populations of the species were discovered that had been heretofore unknown to the FWS. The populations identified were so extensive that the FWS removed the species from candidate status in 1998. This example demonstrates the value of DoD-mandated biological inventories in helping the military services and the FWS understand better the actual condition of critical species. Had this species been listed, populations on Nellis Air Force Base, as well as potentially on Nellis Range, would have required extensive protective measures and many base-level operations would have been negatively impacted.
- Huachuca Springsnail, Lemon Lily, and the Huachuca Groundsel at Fort Huachuca, AZ – These 3 species (one invertebrate and two plants) were at one time all being considered for listed and or candidate species. Fort Huachuca biologists as part of their survey work and coordination with the USFWS demonstrated that these species were more abundant then previously thought by the USFWS. This has lead to the eventual non -listing of the Huachuca Springsnail and the removal of the Lemon Lily and the Huachuca Groundsel from the candidate list. This example illustrates the value of the DoD/Army mandated biological surveys in helping the Army gather the required information needed to effectively management its natural resources and protect its mission from potential regulatory constraints.
- Sonoran Pronghorn Antelope – one of four sub-species of pronghorn antelope in the U.S., and a listed species which occurs on the Goldwater Range. FWS intuitively believed this species obtained water metabolically. A small project was funded (\$50K) to determine if this was indeed the case. Motion-sensitive cameras were installed near waterholes and captured images of Sonoran pronghorn antelope drinking. Providing watering sources therefore became a viable way of improving habitat for this species. This information

was used during consultation with FWS for Marine Corps activities on Goldwater Range and was key to understanding why pronghorn favored the impact areas of the North and South TAC Ranges (they were drinking from bomb craters).

The ESA is one of the most emotionally charged, politically challenging environmental laws enacted by Congress. For the last 10 years it has been a lightning rod among environmental advocacy groups and private property rights groups. Both advocacy groups have become used to using the court system to address their concerns. The requirements of ESA are stringent and will likely remain so as Congress has not modified the law for the last 15 years.

This Action Plan illustrates several examples of ESA and critical habitat challenges the Services are facing as they meet mission requirements, mission impacts from these examples, Service commitments to protect listed species and their critical habitats, and recommendations to better meet our conservation and mission requirements. We are confident that by proceeding with the development and implementation of our Integrated Natural Resources Management Plans and continuing to cultivate better partnerships with FWS and NMFS, DoD can accomplish its military mission and stewardship obligations. Conservation and military readiness are not mutually exclusive. We must identify, understand, and manage the relationship between the two. This Action Plan will set us on a course to do so.

Specific Examples of Challenges

Examples presented are but a few of the more notorious being worked by the Services. While a complete listing of ESA/critical habitat challenges facing DoD has not been compiled, it is a fair assumption that every installation that supports listed species or has suitable habitat to support a listed species is facing some kind of challenge in using its land for testing and training.

Army

National Training Center (NTC) Fort Irwin, CA, and critical habitat issues: NTC requires an additional 193,300 Net Maneuverable Acres in order to effectively meet its training mission. The preferred lands are occupied habitat for the threatened desert tortoise. In order to acquire these lands and mitigate the potential impact to the desert tortoise, the Secretary of Defense and Secretary of the Department of Interior have reached a compromise to expand the range by 131,000 acres and purchase mitigation land for a desert tortoise preserve and other mitigation measures for an estimated \$75 million. Actual expansion will be considerably delayed.

Endangered species protection at Makua Military Reservation HI: Makua Military Reservation supports 32 endangered species. The 4,190-acre Reservation has been used for military training by all the Services since the 1940's. The live-fire and maneuver training range (approximately 800 acres) was closed in 1998 until endangered species consultation and a mitigation plan could be developed. The mitigation plan places restrictions on training to protect listed species that include elimination of the use of incendiary devices and some weapons.

Navy

NAB Coronado CA and critical habitat Issues: FWS designated critical habitat for the western snowy plover (a shorebird) on 7 Dec 99 for the Pacific Coast population, including areas on NAB Coronado, NAS North Island, NAWS Point Mugu, NRRF Imperial Beach, San Nicholas Island, and Vandenberg AFB. This designation is also one of the first to include unoccupied habitat. NAB Coronado is assessing the need to reinitiate consultations to ensure its military activities do not adversely modify unoccupied critical habitat. This consultation may cause delays and restrictions on training activities at NAB Coronado.

Endangered species protection at San Clemente Island, CA: San Clemente Island (SCI) is utilized by all military services for many types of training; the ship to shore range (SHOBA) is the only one left in the eastern Pacific. SCI is home to eleven endangered species, including the SCI loggerhead shrike (a bird) which nests in SHOBA. Only about 30 shrikes exist in the wild on SCI, causing the SCI loggerhead shrike to be considered by some to be the rarest bird in North America. The Navy has spent about \$1 million annually since 1996 and adjusted mission use of the island since 1992 to accommodate shrike recovery and habitat needs. The Navy is required to increase the shrike population in order to increase operational flexibility and preserve continued use of the range.

Air Force

Air Force Alaska Ranges and critical habitat issues: If made final, the recent proposal to designate large areas of the State of Alaska as critical habitat for the spectacled and Stellar's eiders may significantly impact Air Force operations. Eleven Air Force short and long range radar sites fall within the potential designated areas even though only one site currently contains an active nest for a spectacled eider. More importantly, however, Air Force training routes fly over much of the potential critical habitat. Since the FWS has yet to state restrictions that may accompany the designation of unoccupied critical habitat for those species, the impact on Air Force operations cannot yet be assessed. However, depending on FWS restrictions, impacts on Air Force flying operations could be significant.

Endangered species protection at Goldwater Range, AZ: The Air Force entered into consultation with FWS in 1996 regarding the potential effects of Air Force operations on the Sonoran pronghorn antelope at the Goldwater Range. FWS stipulated a number of mitigation measures, which have altered Air Force training operations on two of the tactical ranges. Stringent monitoring of the ranges by two biologists is required prior to air missions. If antelope are located within 5 km of the live ordnance drop zone, the mission is cancelled. If antelope are located within 3 km of a drop zone for practice munitions (non explosive) the mission is cancelled. Additional mitigation requires conducting studies on fawning rates, effects of aircraft overflight noise, and potential munitions chemical contamination. Based on the results of the noise and fawning studies, some range practices, such as ordnance cleanup, have been adjusted to reduce the impact on the antelope. Finally, the Air Force is conducting a study to determine the effects of supplemental food plots on the survival of the antelope.

Marine Corps

MCB Camp Pendleton CA and critical habitat issues: Of the 17 listed species that use or occupy MCB Camp Pendleton, critical habitat has been proposed for three species and designated for two species, including all 17 miles of beach. Over 70,000 acres, about 56%, of Camp Pendleton were layered by multiple proposals for designation as critical habitat. About 88% of the proposed designated areas are unoccupied habitat. FWS decided not to designate critical habitat at Camp Pendleton for two species as the benefits of not designating habitat outweighed the benefits of critical habitat designation. This is the first time that FWS decided not to designate critical habitat for other than biological reasons. Construction and environmental advocacy groups have already stated their intent to sue FWS over this decision. FWS decided to designate habitat for two species, the tidewater goby (small fish) and southwestern willow flycatcher (songbird) and designated about 2,000 acres of the riparian areas of the base along the Pacific Ocean. Habitat designation is pending for the fifth species.

Endangered species protection at MCB Camp Lejeune, NC: Endangered red-cockaded woodpecker (RCW) population data from 1999 indicated that MCB Camp Lejeune contained 36,922 acres of habitat and 51 RCW population clusters. Many of these clusters are found in or adjacent to established training areas. In 1996, in order to protect both the species and the mission, MCB Camp Lejeune developed a "Mission Compatible Plan for the Comprehensive Long Range Management of the Red cockaded Woodpecker and Biological Assessment on Operations at MCB Camp Lejeune." Through 3 years of consultation and negotiation with FWS, a management plan was approved. This plan impacts military activities over about 5% of the base, and governs timing, tempo and equipment restrictions on training.

Impacts to Mission: Compliance with the ESA and concomitant protection of listed species and their habitats has not resulted in a reported loss of readiness. However, in order to maintain readiness, the Services have modified the timing, tempo, equipment used and location of training. These modifications have a direct effect on training, hence on readiness. The use of inert ordnance, reduced training time and other modifications that make training less realistic. Additionally, these modifications have a cost in terms of personnel time, equipment usage, and funding to support training changes. Examples presented in terms of impacts to readiness are characterized based on the difficulty of a Service to modify a training activity in order to meet readiness requirements.

1. **Minor Impacts:** The Marine Corps has experienced minor impacts in maintaining readiness as a result of the RCW plan at Camp Lejeune. Timing, tempo and equipment use of some types of training had to be modified. In addition, groups of RCW clusters were designated as “research clusters” with minimal restriction around them in order to collect data on the impacts of military training and disturbance on RCW populations.

The Air Force has experienced minor impacts on readiness training while using the Goldwater Range, AZ. In 1999, a total of 358 live ordnance missions were scheduled on the two live ordnance tactical ranges. Of those, 6 were cancelled and 125 had to be adjusted because of the presence of the Sonoran pronghorn antelope on the target areas. Though the current agreement with FWS is legally sufficient, a pending lawsuit creates the potential for a new agreement, which may not be as flexible and result in greater training restrictions.

2. **Moderate Impacts:** The Air Force potentially could face restrictions on overflights if proposed critical habitat designations on unoccupied areas for the Spectacled and Stellar’s eiders in Alaska are made final. Although the exact consequences of such a designation have not been determined as land use restrictions have not yet been set by FWS, these restrictions could potentially result in moderate impacts to maintaining readiness by restricting the use of existing low-level overflight corridors and airspace.
3. **High Impacts:** The Navy has experienced high mission impacts at San Clemente Island. Predator control and captive breeding programs to recover the loggerhead shrike cost \$1.5 million annually. During certain times of the year, the Navy can only use the southern half of the island 3 days a week to allow researchers access to monitor shrike recovery. In the event the shrike population declines, it is likely FWS would further restrict training on SCI and may prohibit the use of the ship to shore bombardment range.

The Army has experienced high mission impacts at NTC due to the desert tortoise and its designated critical habitat. The lack of adequate maneuver space limits the Army in conducting realistic brigade-sized and battalion task force training operations. It is the only instrumented training area in the world suited for live fire training of heavy brigade sized and battalion task forces. Expansion of NTC is essential to maintaining operational readiness.

4. **Severe Impacts:** The Navy may experience severe impacts to their ability to conduct training at NAB Coronado. The base is the single Navy site, worldwide, for training for a number of capabilities with national importance. Designation of critical habitat at NAB Coronado potentially means training activities will need to be substantially altered or conducted elsewhere. Consultation with FWS is underway; however, it is possible that land use restrictions will be such that some activities currently being conducted will not be permitted. The Navy may not be able to relocate some of these training without disruption to training cycles.

The Army is facing severe training impacts at Makua Military Reservation as it remains closed to military training, due in part to listed species mitigation requirements. Makua Military Reservation is an important training resource for the Army and other Pacific Command components in Hawaii. Without the use of this range, training exercises that would normally be conducted on Makua must be relocated or canceled. When the range opens the number of troops using Makua at any one time will be reduced from a 500-member battalion to a 120-member company. The use of TOW missiles, mortars and tracer bullets has been eliminated. The Army has relocated some training to other areas in Hawaii. The Marine Corps use of Makua as an amphibious landing and live fire training site has been restricted to limited amphibious landing use. Mitigation costs are projected to be 1.5 million dollars annually.

5. **Extreme Impacts:** Severe impacts are occurring at Camp Pendleton as a result of existing restrictions, and it is likely that they will become extreme if critical habitat designations are made. Marine Expeditionary Unit (MEU) amphibious landing exercises are restricted to one beach at Camp Pendleton. All other beaches have ESA or other encroachment restrictions that prohibit large unit amphibious landings. It is likely that additional restrictions associated with unoccupied critical habitat designations would prohibit the size of landings required to meet MEU training requirements. While FWS has decided not to designate critical habitat for two species due to impacts on military training, construction and environmental advocacy groups have stated their intent to sue FWS over this decision. A judicial outcome may result in FWS being ordered to reconsider its decision. FWS decided to designate habitat for two species. Des-

ignated areas are located in some of the more heavily used areas for training. Designation for a fifth species is pending.

Ongoing Efforts and Past/Present Initiatives

This is not a complete listing of all initiatives underway. The examples presented are intended to convey the scope of initiatives undertaken by the Services.

Army

NTC Fort Irwin: NTC is aggressively supporting and working on tortoise recovery. Last year, negotiations with FWS were elevated to DA/DOI level and ultimately to the Secretaries of Defense and Interior this fall. The Council on Environmental Quality has been involved to help provide an Administration position supporting expansion. Draft land withdrawal legislation requested by Congress was developed that includes mitigation for the desert tortoise.

Makua Military Reservation: Prior to resuming training at Makua, the Army must complete a Wildland Fire Management Plan for the prevention and suppression of fires. Training at Makua may then begin on a limited basis while further mitigation is performed. These mitigation measures include reducing alien weed invasion, removing feral animals that harm plants and habitat, fencing sensitive areas, and establishing new populations of endangered species in protected areas where they can thrive. The Army has an active Integrated Training Area Management program to analyze and repair the effects on the land caused by training activities. The Army is also preparing an Integrated Natural Resources Management that will integrate all these measures with other environmental activities at Makua.

Navy

NAB Coronado and the Western Snowy Plover: Nest locations are marked and noted when scheduling training operations, and commands are informed to remain clear of marked nesting areas. Briefings are conducted prior to major training operations to ensure all parties are aware of endangered species issues. All operational training beaches are posted with signs to prevent unauthorized access to training beaches and associated nesting areas. Annually, informational letters are sent to Navy Housing residents and patrons of the NAB Coronado Marina to inform them of endangered species issues and to remind them that these areas are off limits. The Navy has also set specific standards for large recurring training operations (e.g., elevated causeway training). Monitoring of plover nesting sites during major training evolutions is conducted to ensure nests are not disturbed. Plover surveys have been funded annually since 1992 and show almost 300% increase in nesting.

Since 1996, about \$675K is spent annually for conservation and management programs for both the California least tern and the western snowy plover.

San Clemente Island and the Loggerhead Shrike:- In 1989, the Navy initiated a recovery program for the shrike in partnership with FWS, California Department of Fish and Game, U.S. Department of Agriculture's Wildlife Services, and Western Foundation of Vertebrate Zoology. In 1991, the Zoological Society of San Diego began to research and develop techniques to artificially incubate and rear loggerhead shrikes. Translocation of chicks raised in captivity has failed. Shrike predator removal has been implemented. By 1994, all feral pigs and goats had been removed, control efforts then focused on reducing the population of feral cats, roof rats, and ravens. In 1998, a predator control program for the San Clemente Island fox, a State-listed species, was initiated. Fox control efforts are sensitive due to balancing the concerns of animal rights organizations with the conservation of the shrike. Fire prevention, containment and suppression strategies have been developed and incorporated, including changes in seasonal use of Target Area 1, placement of targets, daily and weekly use schedules, and use of controlled burns.

Air Force

The Air Force, working in cooperation with the other military services and other federal, state, local, and private partners has begun addressing endangered species and critical habitat conservation within an ecoregional context. Ecoregional studies in the Mojave Desert, Sonoran Desert, Great Basin, Front Range of the Rocky Mountains, and Gulf Coast endeavor to provide a context for the biological diversity within an entire ecoregion, rather than focusing on individual critical species. Such a perspective helps in integrated natural resources management planning while helping to ensure the protection of the entire environment, which in turn benefits critical species. The Air Force is hopeful these efforts will serve as models to potentially replace the very narrow, species specific, protection measures now required by the ESA.

Marine Corps

Camp Pendleton and Critical Habitat: MCB Camp Pendleton adopted programmatic, habitat based approaches to natural resource management. The Base manages its riparian, estuarine, and beach ecosystems through a 1997 agreement with FWS. In addition, the Base is presently in consultation with the FWS for a management plan for its upland species. In cooperation with FWS, the Base will develop, publish and implement an Integrated Natural Resources Management Plan, as required by the Sikes Act. The Base has consistently implemented a policy

of careful stewardship to maintain the Base's open spaces and resources to meet mission requirements.

Camp Lejeune and RCW: In addition to those recovery and conservation efforts outlined in the RCW plan, MCB Camp Lejeune Forestry Division has increased its efforts for longleaf pine restoration in the hopes of creating additional suitable RCW habitat. They have also made great strides in understory management by performing growing season prescribed burns, which benefit the RCW and the training mission. The Camp Lejeune forest management program has been hailed as a model by the Department of the Interior for other Federal land managers to emulate. The base is participating in the ad hoc Long Leaf Pine Ecosystem Initiative, which is currently being led by the Department of Agriculture and Auburn University.

Recommendations

The following are two sets of short, mid, and long-term recommended courses of action for DoD and the Services to address ESA specific issues presented above and courses of action to address encroachment in general. These recommendations have not been staffed through the official coordination process, and some may be objectionable to OSD and/or the Services.

ESA Specific

Short-term

1. FWS is developing a policy that Integrated Natural Resource Management Plans (INRMPs) qualify as “special management plans” and would negate the need for critical habitat designation provided the INRMP:
 - provides conservation benefits to the specific species,
 - provides certainty that the plan will be implemented,
 - and ensures the conservation effort will be effective.

DoD should remain engaged with FWS to help fashion the public debate on such a policy. Further, this creates the opportunity for OSD and the Services to evaluate and, if necessary, revise their natural resources and land management guidance. This guidance needs to match FWS and NMFS guidance on critical habitat designation so that INRMPs can be accepted by FWS or NMFS as special management plans, thus eliminating the need for FWS or NMFS to designate critical habitat on installations. In order for OSD to accomplish the above recommendation, OSD should engage FWS and NMFS to clearly articulate what is expected in our management plans in order to meet their “special manage-

ment plan” standard. This initiative could be accomplished in FY01 using existing resources at OSD and Service headquarters.

2. OSD and Services need to work with FWS and NMFS to establish procedures for timely review of INRMPS. OSD should engage FWS and NMFS to develop a Memorandum of Understanding (MOU) to govern the FWS/NMFS review process of INRMPS. These procedures then need to be disseminated to DoD installations and FWS and NMFS area offices. Workshops for installation, FWS and NMFS personnel to discuss INRMP content and review procedures should be held; there is disagreement among the Services on whether these workshops should be sponsored by OSD, the Services or the RECs. This initiative would require a short-term substantial commitment of existing personnel resources from OSD, Service Headquarters and REC offices and could be accomplished during FY01.
3. FWS, OSD and Services representatives periodically meet to discuss endangered species. This forum for information exchange should be formalized by executing a charter between DoD and DOI. The primary focus of the forum would be to improve communication and coordination among DoD and DOI entities on endangered species issues. This forum would focus on identifying and resolving endangered species concerns of mutual interest, and identify and encourage management actions to be taken by DoD and DOI to improve endangered species management on DoD and DOI lands.
4. OSD has issued policy guidance prohibiting the use of military lands as mitigation sites for off-base, non-military activities (DODINST 4715.3). In short, this policy states that military installations will contribute their fair share to regional biodiversity protection, but no more than their fair share. This policy should remain in force as it assists in fending off “mitigation dumping” attempts by local governments and helps reduce encroachment. While this policy helps us keep our lands unencumbered for military activities, OSD should issue policy on the use of lands outside of installations to meet conservation requirements and reduce encroachment. For example, encumbrance of off-base land by DoD to be set aside for conservation can help insulate installations from many types of incompatible adjacent land uses and reduce encroachment. By preventing development of adjacent off-base land, we prevent military lands from being the last open spaces. This initiative could be accomplished using existing resources at OSD and Service headquarters in FY01.

Mid-term

1. While many examples of ESA/critical habitat and land use restrictions are known, a programmatic assessment of the effect these restrictions pose on testing and readiness training has never been taken. OSD should coordinate the examination by the Services of every installation, special use airspace, and military operating area to identify all restrictions and determine programmatically the cumulative effect these restrictions are having on testing and readiness training. This will require a substantial level of effort over two or more years given the number of DoD installation and complexity of issues involved. DoD should direct the Services to complete this encroachment inventory by FY03.
2. Armed with information gleaned from a programmatic look at DoD land use restrictions, OSD and the Services should engage FWS and NMFS on identifying recovery priorities matched to installation mission requirements. For instance, proximate installations with differing land use requirements may have differing recovery burdens. Though perceived unfair from a local perspective, it may make the most sense from a programmatic perspective to place a greater burden on those installations that do not have mission requirements involving frequent ground disturbance. Much of the discussion with FWS and NMFS would occur during the DoD-wide encroachment data collection effort. Decisions on recovery priorities would be ongoing as new information on species status is developed. DoD should seek to substantially complete recovery priority identification by FY04 with work on recovery actions starting in FY05.
3. OSD and the Services should seek to build new and expand upon existing biodiversity partnerships, such as the Mojave Initiative, the Southwest Strategy, and the BMGR Environmental Council (BEC). The military liaison offices in DOC and DOI, and the RECs should spearhead this effort and prepare a strategy for partnering that identifies gaps to be filled. The purpose of these partnerships is to integrate DoD biodiversity planning with regional planning so that military lands become a source of sensitive species emigration. Ecoregional studies should be encouraged, working in cooperation with the FWS, NMFS, federal and state land management agencies, and environmental groups as a way to accommodate military training and operations with the legal requirements for listed species protection and conservation. This will require additional personnel resources or expertise for the REC offices. At a minimum each REC office will need to devote one work-year annually to this effort. Resources should be made available in FY01. The partnership strategy should be delivered to the OSD Range Sustainment Office by FY02. Funding for implementation should be made available in FY03.

4. The Services should focus on indicator species in selected ecosystems that are not currently listed in order to prevent their listing (e.g., the flat tailed horned lizard management plan in AZ is a good example of such partnership between DOI and proximate land managers). Working through the DOC and DOI military liaison offices would be the most efficient way to coordinate efforts with other Federal agencies. This proactive approach will provide the opportunity to work with NMFS and FWS to help develop appropriate conservation plans and avoid future critical habitat designation. This initiative will require additional personnel resources by the Services to staff the military liaison offices. It is possible that the REC Offices also will need to increase personnel resources in order to work with regional biodiversity initiatives to mesh the various activities of proximate land-owners. OSD will need to modify policies to provide Services the opportunity to include such policies in the “must fund” category, beginning with FY01 guidance. Finally, the Services will need to provide funding necessary to implement species and habitat protection projects to achieve the goal of this recommendation. A notional cost per Service may be \$250K annually per species selected. OSD, working from the encroachment inventory and in coordination with the Services, FWS and NMFS, should identify indicator species of interest to DoD by FY03.
5. OSD should update policy to direct full funding of R&D requirements, and create a resource of technologies or “tool box” to assist installations in identifying, analyzing, and managing encroachment issues. Such tools might include studies similar to the alternative futures study completed for Camp Pendleton, GIS based analysis, modeling and simulation tools, and decision support systems. These studies and technology development would help installations determine the level of development pressure adjacent or proximate to an installation and focus on the impacts to local biodiversity, community services, infrastructure, and, when appropriate, airspace availability. The Camp Pendleton study, initially funded by SERDP in FY96, is being updated and expanded by the Marine Corps to include Miramar. OSD is funding alternative future studies for Fort Huachuca and the Mojave Initiative, and funding regional ecosystem management initiatives for the Sonoran desert, the Great Basin, the Gulf Coastal plain and other regions. Other alternative future studies should be undertaken for installations. Study costs for alternative future studies vary, but a notional cost \$1M per study may be used. OSD, in coordination with the Services, should identify each military installation requiring an alternatives future study by FY04. These studies should be complete by FY06.
6. A chronic problem facing the Services is lack of information regarding impacts to sensitive species from military training. Information is even lacking that a listed species is indeed a separate species vice a sub-species. Given this lack of infor-

mation, FWS is forced to be conservative on the side of listed species, which forces testing and training modifications to be made.

Consideration is being given to issue a PBD for endangered species issues for FY02.

If issued, the PBD should focus on:

- Studies, analysis and other proactive measures (inventory, monitoring, habitat improvement, impact analysis) to identify and conserve rare and imperiled species before they require legal protection.
- Enhancement of key installation INRMPs where critical habitat designation is or may be expected to conflict with mission requirements. Enhancement would focus on meeting or exceeding FWS requirements outlined in the recent Camp Pendleton/Miramar decisions to exclude these bases from critical habitat. The goal is to ensure that all DoD INRMPs provide a sufficient level of protection that is equal or greater than that afforded by critical habitat.
- INRMP implementation pilots at certain key installations to further evaluate effectiveness of the INRMP and its implementation in meeting FWS requirements for providing a suitable level of protection that is greater than afforded by critical habitat.

A concerted R&D effort should be made beginning in FY03 to develop information to more effectively and proactively manage endangered species, species at risk, and associated habitat to achieve greater flexibility in meeting mission requirements on installations and ranges.

Notionally, such funding would support critical needs and priority actions identified by the Secretary of the Military Departments within five broad categories: 1) Research and Development, 2) Ecosystem Management, 3) Conservation Easements, 4) Staffing, and 5) Species at Risk. Projects and activities will focus on:

- Research and development strategies to develop innovative and cost saving methods to identify and reduce the impact of military activities on endangered species and to improve management of these species.
- Broad ecosystem-based initiatives that promote consensus building, regional goals, multiple species management, and on-the-ground partnerships (examples include Mojave and Sonoran Initiatives).
- Funding for conservation easements to buffer existing test and training activities and as an offset to allow training on military lands in areas now affected by critical habitat designation, or areas under future consideration;
- Increased manpower at priority installations to handle increased endangered species regulatory consultations and to facilitate effective outreach strategies;

- Proactive measures (monitoring, habitat improvement/protection) to identify and conserve rare and imperiled species before they require legal protection.

Year-one estimates for such an initiative total \$20.5 million. Fifth year funding is estimated at \$41.5 million. Full five year funding totals \$160.5 million.

Endangered Species/Critical Habitat Initiative

Projected Funding Categories	Projected Costs
Additional research and development	\$3M/yr, yrs 1-2; \$5M/yr, yrs 3-5
Initiate up to 8 new Ecosystem-based initiatives at \$250K	\$2.0M per year
Purchase Conservation Easement/Operational Offsets at Priority Installations	\$1.5M/yr, yrs 1-2; \$3M/yr, yrs 3-5
Increase staffing at priority installations/ranges	\$5M; \$10M; \$15M; \$20M, \$22.5M respectively years 1-5
Initiate 'Species at Risk' projects	\$9M per year
FIRST YEAR TOTAL	\$ 21.5M
FIVE YEAR TOTAL	\$160.5M

Long-term

1. OSD and Services should advocate reauthorization of the Sikes Act such that installations managed under approved INRMPs are excluded from critical habitat designation. OLA should be prepared to brief appropriate member and committee staffs. This initiative could be accomplished using existing personnel resources at OSD and Service headquarters. It will take several years for this initiative to be embraced by Congress. OLA should begin work once the 107th Congress comes to order to transmit information to appropriate committees on the impacts certain aspects of ESA on military readiness and how slight modification of the Sikes Act can assist DoD while not harming existing protections on sensitive biological resources.

Encroachment Generic

Short-term

1. The role of the RECs as the proponents for ESA programs in relation to public outreach and regional coordination should be defined by OSD and the Services. Currently, RECs authority in the chain of command is not well understood. If they are to become assets for encroachment issues they must be adequately staffed and the chain of command communicated to and accepted by the Services.

Additional staffing could occur in FY01 if funding is provided. Clarification of REC role in ESA coordination could occur in FY01.

2. OSD should establish a Range Sustainment Office; this office would be a permanent addition to the OSD Readiness organization. It would coordinate DoD efforts to combat encroachment. A matrix approach could be taken to obtain subject matter experts from the Services, however, an O-6 should head in the effort assisted by a GS-13/15 civilian deputy. Existing personnel resources could be used and details to the encroachment office would be temporary. Initially, a “Tiger Team” approach, with representation from OSD, Service Headquarters, REC offices and installations could be used to identify current and foreseeable future encroachment issues. This initiative could be accomplished using existing personnel resources or expertise at OSD, Service headquarters, installations and REC offices. It could be implemented in FY01 provided billets and funding were made available.

Mid-term

1. OSD and the Services should expand the military liaison offices in the Departments of Commerce and Interior and the headquarters, regional and local area offices. Currently, the Commerce liaison office consists of one Navy officer at OSC, the Interior liaison office consists of one Air Force officer at OSI. With the increasing number of issues pending between the NMFS, FWS and DoD, these offices should be expanded to include one officer from each Service at the Secretarial level. Further, the Services should place officers at regional and local area offices that have substantial regulatory oversight responsibilities on DoD activities. The liaison offices will continue to serve as the conduit for information exchange between the Departments of Commerce, Defense and Interior, but the expanded offices would be better resourced to work with DOC and DOI to ensure all three departments’ activities are appropriately coordinated. This will require additional personnel resources from each Service. Liaison office staffing should be phased over four years beginning in FY01 and be complete by FY05.
2. Each installation should establish an office to engage community leaders in a positive fashion in order to reduce local land use decisions that directly, indirectly or cumulatively adversely affect the ability of the installation to meet mission requirements. Working together, local communities and installations would define their mutual needs and expectations for a region’s land use, and incorporate this information as part of regional planning efforts. Many, but not all, installations have offices that actively engage the community. Those installations that do not have community engagement offices will need to be staffed appropriately. The Services should strive to have these offices at all bases and stations by FY04.
3. The REC and installations should use results of encroachment studies to communicate DoD concerns to regional and local regulatory bodies (e.g., local zoning

boards, Natural Communities Conservation Planning groups) to ensure land use decisions are made with full knowledge of impacts on installation mission requirements. OSD and the Services should use results to communicate concerns to national leaders and cabinet departments. Personnel resources to conduct outreach efforts may need to be increased, particularly at REC and installations. This will be an ongoing effort that should be in full swing by FY03.

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